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Aloes and Lilies of Ethiopia and Eritrea

Sebsebe Demissew Inger Nordal



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Front cover: *Aloe steudneri*
Back cover: *Kniphofia foliosa*

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Preface

The publication of a modern Flora of Ethiopia and Eritrea is now completed. One of the major achievements of the Flora is having a complete account of all the Monocotyledons. These are found in Volumes 6 (1997 – all monocots except the grasses) and 7 (1995 – the grasses) of the Flora. One of the main aims of publishing the Flora of Ethiopia and Eritrea was to stimulate further research in the region. This challenge was taken by the authors (with important input also from Odd E. Stabbetorp) in 2003 when the first edition of ‘Flowers of Ethiopia and Eritrea: Aloes and other Lilies’ was published (a book now out of print). The project was supported through the NUFU (Norwegian Council for Higher Education’s Programme for Development Research and Education) funded Project of the University of Oslo, Department of Biology, and Addis Ababa University, National Herbarium in the Biology Department.

What you have at hand is a second updated version of ‘Flowers of Ethiopia and Eritrea: Aloes and other Lilies’. In the preface to the 2003 version Sue Edwards and Inga Hedberg (co-editors together with Sebsebe Demissew) of Volume 6 of the Flora of Ethiopia and Eritrea wrote: “We, therefore, welcome the publication of ‘Flowers of Ethiopia and Eritrea: Aloes and other Lilies’ and hope it will inspire other authors to produce similar books for different groups of plants. That in fact has happened with the publication of ‘Field guide to Ethiopian Orchids’ by Sebsebe Demissew, Phil Cribb and Finn Rasmussen, which appeared in 2004. These books are intended to be guides useful to a wider audience than professional botanists: students, teachers, conservationists, and amateurs interested in understanding and exploring parts of the flora of Ethiopia and Eritrea.

The two editions of ‘Aloes and other Lilies’ well illustrate the importance of the continued research in the Flora area. In the 6 years period from 1997 to 2003 for example two new endemic species of *Aloe* and two new endemic species of *Chlorophytum* were described. In the

next 7 years period up to 2010, another six species of *Aloe* and one species of *Chlorophytum* were described – two genera where active research has taken place during the last decade.

The book now contains 16 families (see further under “What is a lily?”). We have also commented on the uses and conservation status of many of the groups. In addition to the introductory part (including vegetation description), this book gives descriptions and distribution maps for 200 species in 42 genera. Approximately 50% of the species are illustrated with photographs.

Despite their attractive flowers, many of these species are poorly studied. As can be seen from the information on flowering periods, this is because these plants often flower at times of the year when little plant collecting is done, like the start of the rainy season and during the drier months of the year. The importance of having year-round observation and collection is emphasised. It is hoped that also this book will stimulate more people, particularly school teachers and professionals working with natural resource management, to make year-round observations of the plants growing in their areas. It is certain that more new lilies will be discovered in Ethiopia and Eritrea in the years to come, and we hope that this small book will stimulate interest in these botanical treasures.

Acknowledgements

The authors would like to acknowledge the support given by NUFU (Project 11/96 and 53/03) under the collaborative program between Addis Ababa University and the University of Oslo. We would like to thank the Editors of the Flora of Ethiopia and Eritrea, Dr. Inga Hedberg and Ms Sue Edwards, for giving the permission to use information from Volume 6.

We are grateful to the individuals at all institutions who facilitated the smooth running of the project. The great help provided by the Curators and Keepers of the National Herbarium in Addis Ababa (ETH) and the Royal Botanic Gardens, Kew (K), is acknowledged. The latter is particularly acknowledged for providing permission to use some of the illustrations and introductory part from the book “Field guide to Ethiopian Orchids (Sebsebe Demissew *et al* 2004).

Odd E. Stabbetorp (NINA) was crucial for the handling of detailed distribution maps and information in the first edition. In this second edition we have simplified this information by plotting only the occurrence in floristic regions as delineated in Figure 2. Steven Bachman and Fisseha Getachew have assisted in this mapping project and are acknowledged.

We would like to extend our thanks and appreciation to friends and colleagues that provided us with additional photos of plant species that we did not have. The most important contributors have been Mike Gilbert, Ib Friis and Christof Herrmann. A complete list of photographers is given at the end of the book.

The preparation of the camera ready manuscripts for this new edition (and also for the first edition) was undertaken by the able Jan Wesenberg, to whom we express our sincere gratitude.

Many thanks to many colleagues, research assistants, and students, who in one way or another have contributed to the publication of this book. Although many have helped us in this process, the mistakes or errors that may be encountered, are our own responsibility.

Sebsebe Demissew, Addis Ababa University

Inger Nordal, University of Oslo

January 2010

Introduction

Ethiopia and Eritrea are two countries with varied topography and climate from hot semi-desert temperature and an altitude of 115 m below sea level in the Afar depression to cooler climates at 4620 m altitude at the top of the Semien mountains. These contrasting temperature and altitudes coupled with geology have resulted in niches that include about 6000 species of higher plants and of which about 10–12% are endemic. Of these species, about 1322 species are monocots (22%), with grasses accounting to 612 species (c.10%) and the remaining monocots including orchids cover about 710 species (c.12% of the flora). In this book only the monocots that might be considered as “lilies” (see p. 38) are included.

In this introductory part, the many underlying factors that influence the vegetation of a given country or region that work on different time scales are briefly described. Of these, geology, geography and climate (rainfall and temperature), that have worked for a very long time, and the human influence, that has worked for a much shorter span of time are important factors. The moderate human interference in a landscape works in a way that tends to diversify the vegetation – creating more vegetation types than before the beginning of human activity – while strong and prolonged human interference can totally degrade a range of vegetation types to a badly eroded and denuded landscape with very little differentiation of the vegetation left.

The main information on the geology, geography and climate included is obtained from Ethiopian sources. However, the information provided also applies to Eritrea that shares a strong similarity with northern parts of Ethiopia (mainly the Gonder, Tigray and Afar floristic regions) except for the coastal part, which is unique for Eritrea.

Geology

Ethiopia's and Eritrea's geology is based on an old crystalline block, originally part of an immense area that stretched from India to Brazil and formed part of the ancient super-continent Gondwanaland. The hard crystalline rocks are mainly granites and gneisses, and contain many valuable mineral deposits.

Precambrian rocks with ages of over 600 million years, found in parts of Tigray, Gonder, Gojam, Harerge, Sidamo, Bale Illubabor and Wellega floristic regions, are the oldest rocks in the country and form the basement on which younger formations lie (Ethiopian Mapping Authority, 1988). These include a wide variety of sedimentary, volcanic and intrusive rocks that have been metamorphosed to varying degrees. In the southern and western parts of the country, these have been more strongly metamorphosed than their counterparts in the north. This is mainly due to the fact that the rocks in the north have been subjected to relatively lower temperatures.

Towards the end of the Precambrian, a major uplift followed by a long period of erosion took place. Sediments deposited during the Paleozoic interval (which lasted some 375 million years) have been largely removed by erosion.

During the Mesozoic (starting about 225 million years ago), subsidence occurred and the sea initially spread over the Ogaden then gradually extended further north and west. As the depth of the water increased, sandstone, mudstone and limestone were deposited. As the land mass was again uplifted, sedimentation ended in the western parts of the country with the deposition of clay, silt, sand, and conglomerate from the land as the sea receded. In the south-eastern parts, gypsum and anhydrite deposits were precipitated.

In the Early Cenozoic (which began 65 million years ago), extensive faulting took place. However, the major displacement along the fault systems of the Red Sea, Gulf of Aden and East African Rifts occurred later during the Tertiary. Faulting was accompanied by widespread volcanic activity which led to the deposition of vast quantities of basalt, especially over the western half of the country. The great table-lands of the centre, north-west and east were built up by the spreading of deep basalts. Their erosion has now produced the spectacular

mountain scenery around the edges of the plateau, such as the Semien Mountains with its dramatic jagged pinnacles, precipices and gorges. The faulting was followed by, and alternated with, the eruption of large amounts of ash and coarser material, forming the Trap Series.

Ethiopia's largest lake, Lake Tana, is the result of the damming of a large natural drainage area on the western plateau. The Blue Nile disgorges from the Lake and has carved a deep, steep-sided gorge as it runs in an arc around the eastern and southern sides of the lake. The Tis Isat Falls close to the lake are where the Blue Nile runs over the edge of an ancient lava flow.

More recent volcanic activity is associated with the development of the Rift Valley, activity being concentrated within the Rift and along the edges of the adjoining plateaux and also in the Danakil Depression. Plugs of old volcanoes are seen throughout the highlands. Hot springs are frequent in many areas and earth tremors are not uncommon. The recent sediments (conglomerate, sand, clay, and reef limestone) which accumulated in the Afar Depression and at the northern end of the main Rift Valley are of Quaternary age.

Geography

Ethiopia is located between 3° and 15°N and 33° and 48°E. It is a large (1.12 million km²) and highly diverse country. It is a country of dramatic contrasts, with Ras Dashen (Dejen) in the Semien mountains reaching to about 4620 m to the Afar Depression in the Danakil Desert sinking to 115 m below sea level. Some parts the highlands are dissected and form sharp peaks on the horizon, giving the impression, as one observer remarked, of "a country with a table upside-down" (Fig. 1).

Although much of the interior consists of highland plateaux, these are interrupted by deep gorges and valleys formed by the large rivers and their tributaries such as the Abay (Blue Nile), Tekeze, Mereb, Awash, Omo, Genale, Wabishebbelle and Baro. The African Rift Valley divides the country in two: the north-western highlands on one side and the south-eastern highlands on the other. Both these highland systems gradually decrease in elevation to form vast arid or semi-arid lowlands in the east, west, and southern parts of the country. The Rift Valley is itself

Fig.1. Semien Mountains, Gonder floristic region.



a dramatic sight with land falling away into a broad gorge up to 2000 m deep. Whereas the upper parts of the Rift Valley are covered in evergreen forest to grassland, the bottom of the gorge is a land of hot, dry savannahs and deserts, with groups of large lakes. The natural landscape of Ethiopia has been greatly affected by human activities, especially agricultural ones over many centuries (Sebsebe Demissew, *et al.* 2003).

Eritrea (c. 124.320 km²) is located in North East Africa between 12° and 18° north, and 36° and 44° east and includes the Dahlak Archipelago and other islands along the Red Sea coast (<http://www.eritrea.be/old/eritrea-geography.htm>). It shows geographical variation varying between near Lake Kulul within the Afar Depression 75 m below sea level to the highest point in Mt. Soira at 3018 m. The central plateau varies from 1800 to 3000 m (http://en.wikipedia.org/wiki/Geography_of_Eritrea).

Climate

Ethiopia exhibits a wide variation in its climate. In the Semien and Bale Mountains snowfalls are periodically experienced; in the Danakil Desert, daytime temperatures can reach 50°C or more. As a rule, the central highlands have a temperate climate without extremes of temperature. In contrast, the eastern and southern lowlands are hot and the southern rift valley has a hot and seasonally moist climate.

Eritrea also exhibits a variation in its climate. In the north-central parts of the country with highlands ranging between 1800 and 3000 m experience a cooler climate, while the eastern lowlands along the Red Sea coast and the western plains towards the Sudan border experience a very hot climate (<http://www.eritrea.be/old/eritrea-geography.htm>).

Elevation, temperature and rainfall are thus the major influences on the climate of both Ethiopia and Eritrea.

Temperature

In Ethiopia, temperature is mainly influenced by latitude and elevation (Ethiopian Mapping Authority, 1988). True tropical temperatures are encountered in low-lying areas, especially in the east, south and west along the country's borders. Much of the central part of Ethiopia is mountainous, with the highest peaks reaching to over 4000 m. Because the highlands mostly lie over 1500 m altitude, typical tropical temperatures are unusual. Thus temperature decreases towards the interior, with the mean annual temperature ranging from about 40°C in the lowlands to less than 10°C in the highest areas. Daily extremes of temperature can be experienced, depending on one's location.

In Eritrea, the temperature is hot, dry desert strip along Red Sea coast and cooler and wetter in the central highlands with areas that reach to 3000 m.

Rainfall

The rainfall pattern in Ethiopia is influenced by two rain-bearing wind systems, one bringing the westerly winds from the South Atlantic and the other bringing the easterly winds from the Indian Ocean and from the Arabian Sea. The two systems alternate, producing different rainfall regimes in different parts of the country.

Four major rainfall regimes experienced in Ethiopia are shown in Fig. 2 and are characterized as follows.

- A The central, eastern and north-eastern areas of the country receive a bimodal (two peak) rainfall pattern. The small spring rains between February and May come from the Arabian Sea and the big summer rains, between June and September, mainly come from the South Atlantic, but also from the Indian Ocean. Both these periods of rain decrease in length and amount northwards.
- B The south-western and western areas of the country have a single wet period, usually between May and September.

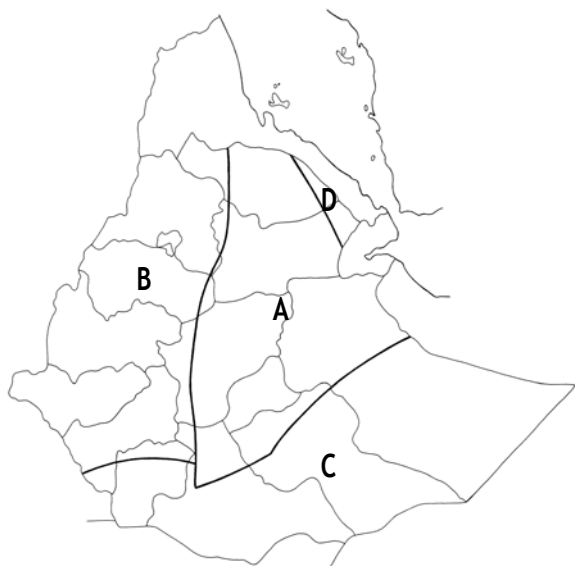


Fig.2. Major rainfall patterns in Ethiopia.

Abbreviations used:

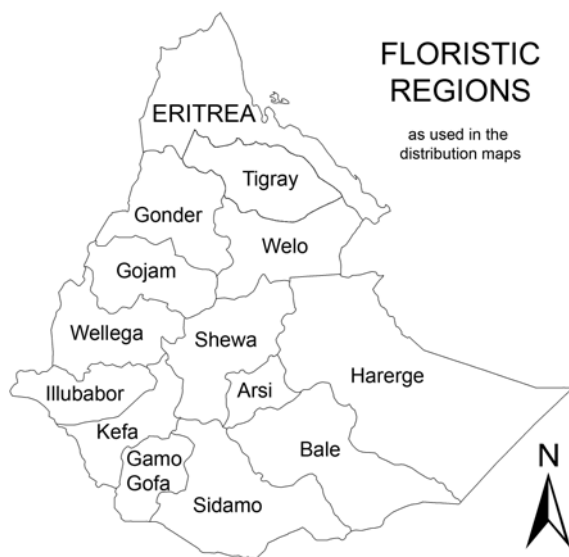
A bimodal rainfall: February-May/ June-September; B unimodal rainfall; C bimodal rainfall: September-November/ March-May; D scanty rainfall but November-February rainfall maximum.

This is influenced by both the wind systems coming from the South Atlantic and the Indian Ocean. The length of the wet season decreases northwards. The south-western highlands receive the highest mean annual rainfall in the country reaching over 2700 mm.

- C The southern and south-eastern parts of the country receive a distinctly bimodal rainfall with the first peak between September and November and the second between March and May. There is a distinct dry spell between the two peaks. This rainfall pattern is mainly influenced by the monsoon winds from the Indian Ocean.
- D Parts of the Afar and coastal parts of Eritrea characterized by scanty rainfall between November and February.

Much of the highland in Eritrea follows the same rainfall pattern as in northern Ethiopia. However, in the coastal parts of Eritrea the rainfall is scanty, but with a pronounced winter-rain between November and February. In Eritrea, three geographic regions can be recognized that experience varied amount of rainfall; the first one is a narrow eastern lowland desert strip along the

Fig. 3. Floristic regions of Ethiopia and Eritrea, as used in the distribution maps.

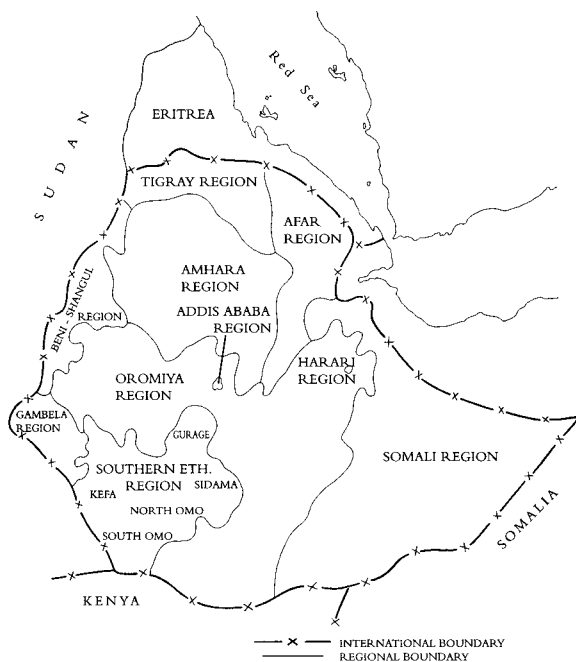


Red Sea Coast that experience erratic rainfall regimes; the second region, which is the northern extension of the Ethiopian Plateau in the north-central parts and dissected by the valleys of westward flowing rivers. This region receives up to 900 mm of rain per year. The third region occupies the area in western plains, that covers a wide area extending to Eritrea's western border with Sudan is the most arid area in the country, receiving only 200 mm of rain per year (<http://www.eritrea.be/old/eritrea-geography.htm>).

The floristic regions of Ethiopia and Eritrea

The indicated distributions of the species in this book follow the floristic regions as used in the Flora of Ethiopia and Eritrea (Fig. 3). These do not necessarily follow the existing political boundaries within the countries. Current Regions and Zones of Ethiopia are shown in Fig. 4.

Fig. 4. Current regions and zones of Ethiopia, from Sebsebe Demissew *et al.* (2004).

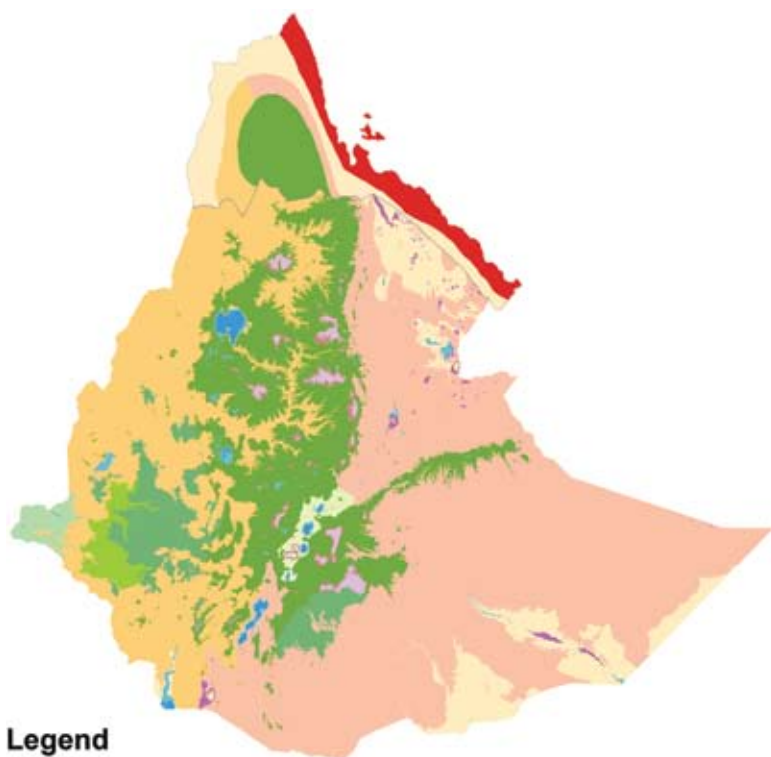


Brief description of the vegetation types in Ethiopia and Eritrea

Over the last 50 years, there have been a number of attempts to map the vegetation of Ethiopia and Eritrea on scales between 1:5,000,000 and 1:10,000,000. A detailed summary was given by Friis & Sebsebe Demissew (2001).

In the first edition of the book, “Flowers of Ethiopia and Eritrea: Aloes and other Lilies” published in 2003, the vegetation map was following Sebsebe *et al.* (1996), CSE (1997) and Friis (1992) with a scale of 1:10,000,000.

Fig. 5 (Opposite page). Vegetation map of Ethiopia and Eritrea. Ethiopian part of the map with permission redrawn and simplified from Atlas of the potential Vegetation of Ethiopia (Friis *et al.* in prep.); Eritrean part of the map based on Sebsebe Demissew *et al.* (2003).



Legend

Potential Natural Vegetation of Ethiopia

- Desert and semi-desert scrubland (DSS)
- Acacia-Commiphora woodland and bushland proper (ACB)
- Acacia wooded grassland of the Rift Valley (ACB/RV)
- Wooded grassland of the Western Gambela region (WGG)
- Combretum-Terminalia woodland and wooded grassland (CTW)
- Dry evergreen Afromontane forest and grassland complex (DAF)
- Moist evergreen Afromontane forest (MAF)
- Transitional rain forest (TRF)
- Ericaceous belt (EB)
- Afroalpine vegetation (AA)
- Freshwater lakes - open water vegetation (FLV/OW)
- Freshwater marshes and swamps, floodplains and lake shore vegetation (FLV/MFS)
- Salt lakes - open water vegetation (SLV/OW)
- Salt pans, saline/brackish and intermittent wetlands and salt-lake shore vegetation (SLV/SSS)
- Coastal vegetation

Recently a detailed vegetation map for Ethiopia has been published (Friis *et al.*, 2010) with a scale of 1:2,000,000. In this map, 12 vegetation types with 15 mapping units are recognized (see the modified version of the map in Fig. 5). Eritrea shares the same vegetation types that occur in northern Ethiopia, particularly those that occur and continue in Gondar, Tigray and Afar floristic regions.

The twelve vegetation types recognized are: 1. Desert and semi-desert scrubland; 2. *Acacia-Commiphora* woodland and bushland; 3. Wooded grassland of the Western Gambela region; 4. *Combretum-Terminalia* woodland and wooded grassland; 5. Dry evergreen Afromontane forest and grassland complex; 6. Moist evergreen Afromontane forest; 7. Transitional rain forest; 8. Ericaceous belt; 9. Afroalpine vegetation; 10. Riverine vegetation; 11. Freshwater lakes, lakeshores, marshes, swamps and floodplains vegetation, and 12. Salt-water lakes, lake shores, salt marshes and pan vegetation.

Eritrea shares seven of the vegetation types (Desert and semi-desert scrubland; *Acacia-Commiphora* woodland and bushland; *Combretum-Terminalia* woodland and wooded grassland; Dry evergreen Afromontane forest and grassland complex; Riverine vegetation; Freshwater lakes, lake shores, marshes, swamps and floodplains vegetation, and Salt-water lakes, lake shores, salt marshes and pan vegetation) with Ethiopia. In the absence of a similar detailed vegetation map, the authors feel it is practical to use the detailed vegetation map produced for Ethiopia (Friis *et al.*, 2010) to be used as the basis for the description of the vegetation map of Ethiopia and Eritrea (Fig. 5). In addition, Eritrea has a unique vegetation (the coastal vegetation) along the red coast.

1. Desert and semi-desert scrubland (DSS)

This vegetation type occurs in areas with scarce vegetation cover represented by highly drought tolerant plant species. The plants include small trees and shrubby species of *Acacia* (*A. ehrenbergiana*), *Boswellia* (*B. ogadenensis*), *Commiphora* (*C. longipedicellata*, *C. samharensis*, *C. unilobata*) as well as succulents, including species of *Euphorbia* and *Aloe*. The grass species are often annual, such as *Dactyloctenium aegyptium* and species of

Fig. 6. Desert and semi-desert vegetation from Dolo, Sidamo floristic region.



Aristida and *Stipagrostis*, while another characteristic species, *Panicum turgidum*, is perennial. This vegetation type occurs in many parts of the Afar region in low-lying and hot areas extending to the lowlands in northern and western parts of Eritrea, in parts of the Ogaden and around Lake Chew Bahir and the Omo Delta below 400 m.

Some of the *Aloe* that occur in this vegetation type include *A. bertemariae* (endemic) and *A. citrina* (Aloaceae). This vegetation type is marked in pale creamy yellow colour (Fig. 5) and is represented by an example as shown in Fig. 6.

2. *Acacia-Commiphora* woodland and bushland (ACB)

This includes large areas of dry lowlands to the east of the Ethiopian and Eritrean Highlands and in the Rift Valley. Because of considerable differences, this complex has been divided into two subtypes.

Subtype 2a. *Acacia-Commiphora* woodland and bushland proper (ACB)

This vegetation type is characterized by drought tolerant trees and shrubs, with small, either deciduous or evergreen leaves. The understorey mainly consists of shrubs, perennial herbs, often with underground water-storing organs, and grasses, of which a large proportion is annual. The trees and shrubs include species of *Acacia*

(*A. bussei*, *A. drepanolobium*), *Balanites*, *Commiphora*, *Euphorbia* (*E. awashensis*, *E. monacantha*, *E. burgeri*, *E. cryptocaulis*, *E. gymnocalycioides*, all of which are endemic), and *Aloe* species. The ground cover is rich in subshrubs, including species of *Acalypha*, *Barleria*, and *Aerva*. The soils are commonly sandy, derived from Jurassic and Cretaceous limestone and other sedimentary rocks.

This vegetation type occurs in the northern, eastern, central and southern parts of Ethiopia, and eastern and northern parts of Eritrea between 400 and 1800(-1900) m. It is particularly characteristic of extensive areas south and east of the Eastern Ethiopian and Eritrean highlands and the western part of the Afar floristic region.

This vegetation type is particularly rich in Aloes and other lilies including quite a few endemic or near endemic *Aloe* species such as *A. calidophila*, *A. ellenbeckii*, *A. gilbertii*, *A. friisii*, *A. retrospiciens*, *A. mcloughlinii*, *A. pirottae*, *A. otallensis* (Aloaceae); *Ammocharis tinneana* (Amaryllidaceae); *Anthericum neghellense* (endemic), *Chlorophytum pterocarpum* (endemic), *C. somaliense* and *C. zavattarii* (all in Anthericaceae); *Asparagus aridicola*, *A. leptocladodius*, *A. scaberulus* (Asparagaceae); *Bulbine abyssinica* (Asphodelaceae); *Dracaena ellenbeckiana* (Dracaenaceae) and *Ledebouria kirkii* (Hyacinthaceae). This vegetation subtype is marked in dusty pink colour (Fig. 5) and is represented by an example as shown in Fig. 7.

Subtype 2b. *Acacia* wooded grassland of the Rift Valley (ACB/RF)

The *Acacia* wooded grasslands of the Rift Valley consist of a tree stratum mainly or almost entirely with species of *Acacia* over a grass stratum. It is located between the northern, species-poor part of the *Acacia-Commiphora* bushland in the western part of the Afar floristic region and the southern, species rich part of the *Acacia-Commiphora* bushland in the southern and eastern Ethiopian lowlands, but with the absence of members of the genus *Commiphora*. Important characteristic species include species of *Acacia* (*A. etbaica*, *A. seyal*, *A. albida*, *A. tortilis*, *A. senegal*, etc.; *Croton* (*C. dichogamus*) and *Euphorbia* (*E. candelabrum*). The grasses belong mainly to the genera *Hyparrhenia*, *Heteropogon*, *Setaria*, *Sporobolus* and *Panicum*.



Fig. 7. *Acacia-Commiphora* woodland between Konso and Yabello in Sidamo floristic region.

The vegetation type is mainly known in the major part of the Rift Valley around the major rift valley lakes between 1300 to 1800 m. Two of the *Aloe* that occur in this vegetation type include the widespread *Aloe trichosantha* and the endemic *Aloe gilbertii* subsp. *gilbertii* (Aloaceae). This vegetation subtype is marked in palest yellow green colour (Fig. 5) and is represented by an example as shown in Fig. 8.



Fig. 8. *Acacia-Commiphora* woodland of the Rift Valley near Langano, Shewa floristic region.

3. Wooded grassland of the Western Gambela region (WGG)

This vegetation is characterised by a tall grass stratum that burns annually and a canopy layer of trees that can both tolerate burning and temporary flooding. The most dominant species in the tree stratum are species of *Acacia*, especially *A. seyal* and *A. nilotica*. The palms, *Hyphaene thebaica* and *Borassus aethiopicum* may also occur. In the grass stratum species of *Echinochloa*, *Setaria*, *Hyparrhenia*, *Cymbopogon* and *Sorghum* are common. In the most flooded areas there are nearly pure stands of *Oryza*, especially *O. longistaminata*. Moisture tolerant herbs are also common in the flooded areas, e.g. *Caperonia serrata* (Euphorbiaceae) and *Thalia geniculata* (Maranthaceae).

This vegetation type occurs in Ethiopia only in the western part of Gambela at altitudes between 400-450 m. Some of the lilies that occur in this vegetation type include *Chlorophytum cameronii* and *C. macrophyllum* (Anthericaceae). This vegetation type is marked in neutral greyish green colour (Fig. 5).

4. Combretum-Terminalia woodland and wooded grassland (CTW)

This vegetation type is characterized by small to moderate sized trees with fairly large deciduous leaves mainly represented by the family Combretaceae, Fabaceae and Burseraceae. These include: *Boswellia papyrifera*, *Anogeissus leiocarpa*, *Combretum adenogonium*, *C. hartmanianum*, *C. molle*, *C. rochetianum*, *C. collinum*, and species of *Terminalia*, e.g. *T. schimperiana*; *Lonchocarpus laxiflorus*, *Pterocarpus lucens*, *Dalbergia melanoxylon*, *Pilistigma thonningii*, *Acacia hockii*. Other species known from this vegetation type include, *Stereospermum kunthianum*, species of *Lannea*, e.g. *L. barteri* and *L. fruticosa*, *Sclerocarya birrea* and *Vitex doniana*. The solid-stemmed lowland bamboo *Oxytenanthera abyssinica* is also a component of the vegetation type in western Ethiopia. A number of grass species in the genera *Echinochloa*, *Setaria*, *Hyparrhenia*, *Cymbopogon* and *Sorghum* are characteristic of this

vegetation type. This vegetation type has been burned annually for such a long time that the plants show clear adaptations to fire, and it must be assumed not to be adversely affected by controlled annual fires. This vegetation type occurs SW part of Eritrea, along the western escarpment of the Ethiopian plateau, from the border region between Ethiopia and Eritrea to the western Kefa floristic region to the Sudan and the Omo Zone between the 400 and 1800 m.

Some of the endemic *Aloe* and other lilies that occur in this vegetation type include *Aloe benishangulana*, *A. ghibensis* (Aloaceae); *Chlorophytum herrmanni*, *C. pendulum*, *C. serpens* (all in Anthericaceae); *Crinum bambusetum* (Amaryllidaceae) and *Dioscorea abyssinica*, *D. cochleari-apiculata* (Dioscoreaceae). Other lilies that are widespread in west and central Africa, but that reach to this vegetation type in Wellega floristic region in Beni-shangul Gumuz Regional State in western Ethiopia include *Pancratium centrale* (Amaryllidaceae) and *Zygotritonia praecox* (Iridaceae). This vegetation type is marked in yellow ochre colour (Fig. 5) and is represented by an example as shown in Fig. 9.



Fig. 9. *Combretum-Terminalia* woodland, Maze Park, Gamo Gofa floristic region.

5. Dry evergreen Afromontane forest and grassland complex (DAF)

This vegetation type represents a complex system of successions involving extensive grasslands rich in legumes on heavy black clay soils that are periodically inundated. Ethiopian agriculture probably developed thousands of years ago inside areas covered by this vegetation complex, which has been intensely utilised by man ever since. The intensive utilization has resulted in forests that have diminished in area and has largely been replaced by bushlands. This vegetation type occurs in areas between the 1800 and 3000 m and is marked in green colour (Fig. 5).

Four distinct subtypes, have been recognized (Friis, 1992; Friis & Sebsebe Demissew, 2001). However, it has not been possible to define these based on parameters as altitude or rainfall or to draw boundaries between them.

Subtype 5a. Undifferentiated Afromontane forest (DAF/U)

The undifferentiated Afromontane forests are either *Juniperus-Podocarpus* forests, or tend towards single dominant *Podocarpus* or *Juniperus* forests, both with an element of broad-leaved species. They occur especially on the plateaux in the floristic regions of Shewa Wellega, Welo, Sidamo, Bale and Harerge floristic regions at altitudes between 1500 and 2700 m, with annual rainfall between 700 and 1100 mm. The few larger patches that are currently observed appear widely separated by areas of cultivation and wooded grassland. The canopy is usually dominated by the two indigenous gymnosperms (*Juniperus procera* and *Podocarpus falcatus*). In addition, *Olea europaea* subsp. *cuspidata*, *Croton macrostachyus*, and *Ficus* spp. occur frequently. Other medium sized trees include *Allophylus abyssinicus*, *Apodytes dimidiata*, *Celtis africana*, *Olinia rochetiana*, *Prunus africana*, *Teclea nobilis* and *Vepris dainellii*.

Some of the *Aloe* and lilies that occur in this subvegetation type include *A. debrana* (Aloaceae). Other lilies that occur include *Anthericum angustifolium* (Anthericaceae), *Crinum abyssinicum*, *Scadoxus multiflorus* (Amaryllidaceae), and *Dracaena steudneri* (Dracaenaceae).



Fig. 10. Dry Afromontane forest, DAFU type at Chilimo Forest, Shewa floristic region.

This vegetation subtype is not mapped, but represented as shown in Fig. 10.

Subtype 5b. Dry single-dominant Afromontane forest of the Ethiopian highlands (DAF/DS)

According to Friis (1992), this forest occurs especially on the plateaux in Tigray, Gonder, Wello and Harerge floristic regions and also in the Eritrean highlands at altitudes between (1600-) 2200 and 3200 (-3300) m with annual rainfall between 500 and 1500 mm. The typical dominant species in the upper storey of these forests is *Juniperus procera*, with *Olea europaea* subsp. *cuspidata* and a number of other species below. The smaller trees and shrubs include *Acokanthera schimperi*, *Carissa spinarum*, *Clutia abyssinica*, *Euclea racemosa* subsp. *schimperi*, *Grewia ferruginea*, *Maesa lanceolata*, *Morella salicifolia*, *Teclea nobilis* and *Rhus natalensis*. Some of the endemic *Aloe* that occur in this vegetation type include *A. adigratana*, *A. percrassa* and *A. pulcherrima* (Aloaceae). In addition *Aristea abyssinica* (Iridaceae) typically belongs here. This vegetation subtype is not mapped, but represented as shown in Fig. 11.

Fig. 11. Dry Afromontane forest, subtype DAF/DS near Lake Ashenge in Tigray floristic region.



Subtype 5c. Afromontane woodland, wooded grassland and grassland (DAF/WG)

This includes the natural woodlands, wooded grasslands and grasslands of the plateau. When a tree stratum is present, this consists mainly of species of *Acacia* (*A. abyssinica*, *A. lahai*, *A. bavazanoi*, *A. origena* and *A. venosa* in the Ethiopian highlands. This vegetation type with woody species occurs on well drained sites and with edaphic grasslands on areas with black cotton soil which may be flooded during the rains. Thus the vegetation type must be assumed to have formed a mosaic with the forests and evergreen bushland vegetation of the plateau before the influence of man. Pure grasslands are seen in the highlands as for example in the Arsi floristic region between the small towns of Kofele and Adaba.

Some of the *Aloe* that occur in this vegetation type include *A. elegans* and *A. camperi* (Aloaceae). Other lilies include *Aristea angolensis* and *Moraea schimperi* (Iridaceae) and *Kniphofia insignis* (Asphodelaceae). This vegetation subtype is not be mapped , but represented as shown in Fig. 12.

Subtype 5d. Transition between Afromontane vegetation and *Acacia-Commiphora* bushland on the Eastern Escarpment (DAF/TR)

This is a complex of scattered transitional vegetation which includes a range of physiognomic types, but with characteristic and sometimes very unusual species, such as *Barbeya oleoides*, belonging to the monotypic and isolated family Barbeyaceae. The vegetation ranges from open forest (e.g. Negelle, Sidamo) to evergreen scrub with dispersed trees (on the escarpment of the Ethiopian

Fig. 12. Dry
Afromontane
forest *Acacia*
woodland
subtype DAF near
Kosober, Gojam
floristic region.



plateau) or even clumps of evergreen bushland in deciduous *Acacia-Commiphora* bushland, but even more typical in adjacent parts of Somalia). The vegetation type occur scattered on the eastern escarpment of the Ethiopian Highlands, from the border with Eritrea to the Awash Valley, and on the northern escarpment of the highlands in the Harerge floristic region from the Awash Valley to the border with Somalia. The vegetation type is also found on the south-eastern slopes of the eastern Highlands extending along the mountain chain into northern Somalia. Throughout its range this forest type occurs on rocky ground with unimpeded drainage at altitudes between 1500 m and 2400 m and with an annual rainfall of between 400 and 700 mm.

The following species are rather characteristic of the vegetatiin type: *Acokanthera schimperi*, *Barbeya oleoides*, *Berchemia discolor*, *Cadia purpurea*, *Cladostigma dioicum*, *Pistacia aethiopica* and *P. falcata*, *Olea europaea* subsp. *cuspidata*, *Schrebera alata* and *Tarchonanthus camphoratus*. Some of the *Aloe* and lilies that occur in this vegetation type include *A. yavellana* (endemic) (Aloaceae) and species of *Chlorophytum* (Anthericaceae). This vegetation subtype is not be mapped , but represented as shown in Fig. 13.



Fig. 13. Dry Afromontane forest subtype transition at Yabello, Sidamo floristic region.

6. Moist evergreen Afromontane forest (MAF)

This vegetation type is in most cases characterized by one or more closed strata of evergreen trees that may reach a height of 30 to 40 m. Sometimes only the lower stratum remains, due to the removal of the tallest trees. The moist evergreen Afromontane forest, according to Friis (1992) occurs mainly in the south-western part of the Ethiopian Highlands between (1500-) 1800 and 2600 (-3000) m, with an annual rainfall between 700 and 2000 mm (or more). The Harennna Forest on the southern slopes of the Bale Mountains is the easternmost example of this forest.

These forests predominantly contain broad-leaved evergreen species in the multilayered canopy. *Podocarpus falcatus* may occur in the eastern- and northernmost of these forests, but *Podocarpus* is never prominent. However, the other important conifer, *Juniperus procera* does not occur in this type of moist evergreen forest. The most characteristic type of this forest occurs widely in the upland parts of the southern Wellega, Ilubabor (excluding the lowlands), and Kefa floristic regions. It is found in areas between 1500 and 2500 m, with an annual rainfall between 1500 mm and more than 2000 mm, with rain all the year round. The absolute maximum of rainfall in the

area is uncertain, but the estimated maximum of 2600 mm per year is thought to be reached in an area north of the town of Tepi. The large Harennna Forest on the southern side of the Bale Mountains is floristically very closely related to the south-western Ethiopian Afromontane rain forest. Near its lower limit, however, the canopy of this forest contains large specimens of *Podocarpus falcatus*. It would be worthwhile to note if it occurs with the characteristic species mentioned above or occupy a distinct lower zone of its own.

The characteristic emergent species that from the 20-30 m high canopy is *Pouteria adolfi-friederici*. Other characteristic species include *Albizia gummifera*, *A. schimperiana*, *A. grandibracteata*, *Sapium ellipticum*, *Euphorbia ampliphylla*, *Ekebergia capensis*, *Ficus sur*, *Hallea rubrostipulata*, *Ocotea kenyensis*, *Olea welwitschii*, *Polyscias fulva* and *Schefflera abyssinica*. Another very characteristic feature of this vegetation type, at least in its moister forms (but not yet observed in the Harennna Forest), is the tree fern, *Cyathea manniana* (Cyatheaceae). Lianas are also common represented by *Tiliachora troupinii* (endemic), species of *Acacia*, incl. *A. pentagona*. Epiphytes including ferns, lycopods, orchids and *Peperomia spp.* are also encountered. The mountain bamboo *Arundinaria alpina* is not uncommon at higher altitudes in these forests. This vegetation type is marked in Blue green colour (Fig. 5) and occurs in areas between the 1800 and 3000 m and with annual rainfall larger than 1700 mm. The vegetation type can be subdivided into two not very distinct or natural subtypes.

Subtype 6a. Primary or mature secondary moist evergreen Afromontane forest (MAF/P)

This is basically the forest type described above.

Some of the lilies that occur in this vegetation type include the endemic *Scadoxus nutans* (Amaryllidaceae); *Asparagus asparagoides* (Asparagaceae); *Dracaena afromontana* (Dracaenaceae) and *Smilax anceps* (Smilacaceae). The subtype is not mapped separately, but represented as shown in Fig. 14.



Fig. 14. Moist Afromontane Forest near Bonga, Kefa floristic region.

Subtype 6b. Edges of moist evergreen Afromontane forest, bushland, woodland and wooded grassland (MAF/BW)

The subtype represents a grazing-cultivation complex following destruction of the forest, in the regrowth of which it seems to form a seral stage following various forms of woodland, and it is closely associated with communities that occur at forest edges (Friis *et al.*, 1982). One of the lilies that occur in this vegetation type is the endemic *Scadoxus nutans* (Amaryllidaceae). This vegetation subtype is not mapped.

7. Transitional rainforest (TRF)

This forest type was what was earlier considered as subtype 2 of the Moist Afromontane Forest – the *transitional rainforest and the lowland semi-evergreen forest* (Sebsebe Demissew *et al.*, 2003, 2004; Sebsebe Demissew & Friis, 2009). Scattered examples of these forests are known from the western escarpment of the Ethiopian Highlands in the Wellega, Illubabor and Kefa

floristic regions, where the rainfall and hence humidity from the rain-bearing south-westerly winds is highest. The forests occur between 450 and 1500 m elevation. The rainfall is close to 2000 mm or higher (up to 2700 mm), with some rain all the year round. The transitional rainforests are most similar in physiognomy and composition to the humid broad-leaved Afromontane rainforests of south-western Ethiopia (characterized as Moist Afromontane forests). The characteristic species in this vegetation type are *Alstonia boonei*, *Morus mesozygia*, *Pouteria altissima* and *Trilepisium madagascariense*. Other species that are commonly found in this vegetation type are *Baphia abyssinica*, *Celtis toka*, *Diospyros abyssinica*, *Lecaniodiscus fraxinifolius*, *Pouteria (Malacantha) alnifolia*, *Trichilia prieureana*, *Trilepisium madagascariense*, *Zanha golungensis* and *Zanthoxylum leprieurii*. This vegetation type is characteristic of the moist and hot lower slopes of the south-west Ethiopian highlands, between 500 and 1500 m.

Some of the lilies that occur in this vegetation type include *Chlorophytum macrophyllum* (Anthericaceae); *Dracaena fragrans* (Dracaenaceae) and *Smilax anceps* (Smilacaceae). This vegetation type is marked in yellow green colour (Fig. 5) and is represented as shown in Fig. 15.



Fig. 15. Transitional rainforest near Bebek, Illubabor floristic region.

8. The Ericaceous belt (EB)

A well developed Ericaceous belt is characteristic for most of the higher mountains in Ethiopia. However, the upper and lower limits of this vegetation type are quite difficult to define. The vegetation is defined somewhat arbitrarily by its occurrence mainly between the 3000 and the 3200 m. This altitudinal range borders below with the upper zone of the Dry Afromontane forest and the Moist Afromontane forest. The belt is most notable above the Haremma forest in the Bale Mountains. It borders with the Afroalpine zone proper at about 3200 m.

The Ericaceous belt is physiognomically characterized by the dominance of shrubs and shrubby trees such as *Erica arborea*, *Erica (Phillipia) trimera*, *Hypericum revolutum*, *Myrsine melanophloeos* and perennial herbs *Alchemilla haumannii*, *Geranium arabicum*, *Anthemis tigreensis*, *Haplocarpha ruppellii*, *Helichrysum citrispinum*, *H. splendidum*, *H. gofense*, *H. formosissimum*, *Senecio schultzii*, *Trifolium acaule* and *T. burchellianum*.

The highest point in Eritrea is the mountain called Mt Soira, c. 3010 m (<http://www.eritrea.be/old/eritrea-geography.htm>). Thus the *Erica* species might occur, but possibly not forming a belt. But this has to be verified by resident botanists.

Lilies are not commonly found in this vegetation type. However, those species that are found in the Afroalpine vegetation could also be encountered here. This include *Hesperantha petitiana*, *Romulea fischeri* and *R. schimperi* (Iridaceae). This vegetation type is marked in dark pink colour (Fig. 5) and is represented as shown in Fig. 16.

9. Afroalpine vegetation (AA)

This vegetation type is characterized by small trees, shrubs and shrubby herbs at the lower altitudes and giant herbs, small herbs and grasses. It occurs in areas above 3200 m, occupying the highest mountains in the Ethiopia. Some examples include: Amba Alagi (3440 m) in the Tigray floristic region; the Choke Mountains (4070 m) in the Gojam floristic region; the Semien Mountains (the tallest peak in the Semien Mountains, Ras Dashen (4620 m), Mt. Buahit (4510 m) and Abba Yared (4460 m) in the Gonder floristic region; Abyue Meda (4305) in



Fig. 16. Ericaceous belt above Rira, Bale floristic region.

the Shewa floristic region; Guge Highlands (4200) in the Gamo Gofa floristic region; Mt. Kaka (4190 m) in the Arsi floristic region and, the extensive Bale Mountains (in which the highest peaks are Tulu Dimtu (4377 m) and Mt. Batu (4307 m) in the Bale floristic region.

The Afroalpine vegetation is best characterized by a combination of giant *Lobelias*, cushion-forming species of *Helichrysum*, shrubby species of *Alchemilla*, and prominence of temperate grass genera such as *Festuca*, *Poa* and *Agrostis*. The presence of *Lobelia rhynchopetalum* can be taken as an indicator of Afroalpine vegetation. The common grasses include endemic species of *Festuca* (*F. gilbertiana*, *F. macrophylla*), *Poa* (*Poa hedbergii*, *P. chokensis*, *P. simensis*) and *Agrostis* (*A. gracilifolia* subsp. *parviflora*).

One of the endemic *Aloe* species that occur in this vegetation type include *A. ankoberensis*. Other lilies include *Kniphofia foliosa* (Asphodelaceae) *Hesperantha petitiana*, *Romulea fischeri* and *R. schimperi* (Iridaceae). This vegetation type is marked in paler mauve pink colour (Fig. 5) and is represented as shown in Fig. 17.

Fig. 17.
Afroalpine
vegetation -
Senaiti Plateau,
Bale floristic
region.



10. Riverine vegetation (RV)

Ethiopia has several major systems of rivers and tributaries: Abay (Blue-Nile) (starting in north-west), Awash (starting in central), Baro (starting in the west), Omo (starting in central-west), Tekezze (starting in the north), Wabi-Shebele (starting in the south-east).

Eritrea also has some major rivers such as the Anseba and Barka rivers flowing north; the Gash and Tekeze rivers on the border with Ethiopia flowing west into the Sudan. The upper course of the Gash river is known as the Mereb river. These rivers are not year round rivers and do not run on a regular basis, but fed by seasonal rains during the main rainy season (<http://www.eritrea.be/old/eritrea-geography.htm>). These rivers and their tributaries have riverine forests and riparian woodlands in areas below 1800 m. The riverine forest vegetation is very variable, and the floristic composition is dependent on altitude and geographical location. Characteristic common trees in these forests are *Acacia polyacantha* subsp. *campylacantha*, *Ficus sycomorus*, *Salix subserrata*, *Trichilia emetica*, *Diospyros mespiliformis*, *Mimusops kummel*, *Syzygium guineense*, *Tamarindus indica*, *Tamarix nilotica*, *Breonardia salicifolia*, and *Phoenix reclinata*. There is often a shrub layer, and lianas and vascular epiphytes occur. The ground cover includes grasses, ferns, and a few herbaceous dicotyledons. Lilies are uncommon along the major rivers.

Most riverine and riparian habitats are probably to narrow and strip-like to map at the scale of 1:2,000,000 and hence not mapped and marked, but on the original

Fig. 18. Riverine vegetation along the Abay River S of Mankush in Wellega floristic region.



map represented by shown in darker blue lines, but represented as shown in Fig. 18.

11. Fresh-water lakes, lake shores, marsh and floodplain vegetation (FLV)

For freshwater, the generally accepted upper limit of dissolved salts in the water is *c.* 1000 ppm.

However, authors like Wood & Talling (1988), who carried out field studies of the plankton flora in a wide range of Ethiopian lakes followed the classification proposed by Williams (1964), with an upper limit for what is classified as fresh water higher than 1000 ppm i.e up to 3000 ppm. This vegetation type is found in fresh-water lakes with open water, on lake shores, in marshes and Floodplains. Two subtypes are recognized in this major vegetation type. The details of the differences between the two subtypes and the definitions are presented in Friis *et al.* (2010).

Subtype 11a. Freshwater lakes - Open water vegetation (FLV/OW)

This includes lakes which have a concentration of salts below 3000 ppm. This vegetation type is found in the open water. The characteristic species include floating aquatics such as *Eichornia natans* and the invasive *E. crassipes*, native *Lemna aequinoctalis*, *L. gibba*, *L. minor*; *Pistia stratiotes*, *Spirodela polyrrhiza* and *Wolffia arrhiza*.

The major freshwater lakes in Ethiopia include Lake Tana, Lake Zengana, Lake Ashenge, Lakes Hayq and Ardibo, Lakes Langano and Lake Zwai, Lake Awassa, Lakes Abaya, Chamo and Turkana. There are also smaller sized crater lakes such as Bishoftu Crater Lakes. The reservoirs, such as the Koka Reservoir along the Awash River and the Fincha Reservoir along the Fincha River are the two oldest ones.

This vegetation subtype is marked in darker blue areas (Fig. 5) and represented as shown in Fig. 19.

Subtype 11b. Freshwater marshes and swamps, floodplains and lake shore vegetation (FLV/MFS)

A large number of areas with marshy/swamp vegetation occur in the central and western parts of Ethiopia, while there are fewer to the east. Important marsh areas are: the Fogera and Dembia marshes/swamps (in the Gonder floristic region), the Chomen and Dabus marshes/swamps (in the Wellega floristic region), the Cheffa marshes (in the Wello floristic region). There are a large number of smaller sized marshes/swamps dotted throughout the country, mainly in the Ilubabor, Kefa and Wellega floristic regions.

There are also *Floodplains* and *Freshwater intermittent wetlands* in flat or nearly flat lands adjacent to rivers or streams that experiences occasional or periodic flooding. For example: Large expanses near the village of Tefki (at about 50 km west of Addis Abeba on the road to Jima) and near Koka (between the small towns of Mojo and Meki) are examples of flood plains created by the overflow of the Awash River over its banks and the latter also seen in many parts of Ethiopia mainly in the Gojam, Kefa and Illubabor floristic regions.

The characteristic species in freshwater marsh/swamp, floodplain and lake shore vegetation along the shores of fresh water lakes include the sedges such as *Cyperus digitatus*, *C. denudatus*, *C. dichroostachys*, *Juncus dregeanus*, *Floscopa glomerata*, species of *Eriocaulon* and *Xyris*, *Persicaria decipiens*, *Ludwigia abyssinica*, *Chenopodium album*, *Ranunculus multifidus*, *Nymphaea lotus* and *Phoenix reclinata* (Arecaceae). Lilies are rather uncommon in this vegetation type. This vegetation type is marked in paler blue colour (Fig. 5).



Fig. 19. Lake Tana near Gorgora, Gonder floristic region.

12. Salt-water lakes, salt-lake shores, marsh and pan vegetation (SLV)

This vegetation type is characterized by the occurrence of salt tolerant species in or along Salt water lakes, pans and intermittent saline wetlands, where the water is saline with concentration normally taken to be between 3000 and 35,000 ppm as indicated earlier. Only one woody species is known to be associated with this vegetation type, *Suaeda monoica* (Chenopodiaceae), which, however, can form extensive stands on salt pans on the shores of salt lakes. The number of herbaceous species is also low and lilies are not expected to occur.

Two subtypes are recognized in this vegetation type. The details of the differences between the two subtypes and the definitions are presented in Friis *et al.* (2010).

Subtype 12a. Salt-water lakes - open water vegetation (SLV/OW)

These are also known as saline lakes. They are formed where there is no natural outlet and where the water evaporates rapidly leaving a higher amount of salt than normal. The vegetation along these lakes also depends on the measure of salinity, at high salinity the family Chenopodiaceae tends to dominate.

The salts in the salty lakes in the central rift valley including Lakes Abijata, Shala and Chitu (all in the Shewa floristic region) are mainly consisting of sodium bicarbonate (soda lakes), while the salts in the salt Lakes in the more arid parts of the country, where both temperatures and evaporation are high, mainly consists of sodium chloride (the common salt of the ocean). These include Lakes Abe, Afambo and Bario that are fed by the River Awash, the desert lakes Lake Afrera and Karum (Asale) in the Afar Depression. In Eritrea, it is represented by Lake Kulul and similar lakes within the Afar Depression at about 75 m below sea level (http://en.wikipedia.org/wiki/Geography_of_Eritrea). There are hardly any vascular plants known to occur in these lakes. This vegetation type is marked in pale yellow colour (Fig. 5).

Subtype 12b. Salt pans, saline/brackish and intermittent wetlands and salt-lake shore vegetation (SLV/SSS)

This vegetation subtype is characterized by *Suaeda monoica*, herbaceous species of *Atriplex* spp. and *Salicornia* (all in Chenopodiaceae) and is marked in dark mauve colour (Fig. 5).

Coastal vegetation

This vegetation type is characterized by highly salt tolerant plant species along the shores of the Red Sea (Fig. 20). These plants include low shrubs and tussock forming plants, particularly in the families Capparaceae, Chenopodiaceae, Salvadoraceae, Zygophyllaceae and Poaceae (grasses). The mangrove species, *Avicennia marina* and *Rhizophora mucronata* are also components of the coastal vegetation. The areas covered by coastal vegetation are often rocky or sandy, and the latter ones are particularly prone to wind erosion. This vegetation is restricted to the coastal parts of Eritrea, adjacent to the Red Sea and is not mapped. The total coastline for Eritrea is indicated as 2 234 km with Red Sea accounting for 1151 km and other islands in Red Sea accounting to 1083 km (http://en.wikipedia.org/wiki/Geography_of_Eritrea).



Fig. 20. Coastal vegetation in Eritrea, near Masawa, with *Aloe eumassawana*.

One of the *Aloe* species that occur in this vegetation type include *A. eumassawana* (Aloaceae) around Hargigo, near Massawa. It is also currently recorded from Djibouti.

What is a lily?

Lilies in the widest sense are recognised by their 6 more or less equal, often showy, tepals, without differentiation into sepals and petals. Until the first edition of 'The families of flowering plants' (Hutchinson 1934), the delimitation of families within Liliiflorae – i.e. lilies in the widest sense – was fairly simple: 6 stamens and perianth situated below the ovary (hypogynous) meant that the plant belonged to the family Liliaceae; 6 stamens and perianth above the ovary (epigynous) meant Amaryllidaceae; and 3 stamens and perianth above the ovary meant Iridaceae.

This simplistic system started to collapse when Hutchinson proposed to restrict the family Amaryllidaceae to include only bulbous plants with an umbellate inflorescence. In the African flora, this led to the recognition of an additional family, Hypoxidaceae, with corms/tubers and a $\pm$ racemose inflorescence. All information obtained later, from chemistry, micromorphology and molecular data, supported this delimitation, showing that epigynous flowers within the Liliiflorae have developed more than once. In the New World, the more restricted definition of Amaryllidaceae led to the recognition of Alstroemeriaceae and Agavaceae – the latter represented in Africa by introduced species of *Agave*. Iridaceae has, on the other hand, remained fairly constant since its description by Jussieu in late 18th century.

The splitting of the family Liliaceae started rather late. In their book 'The families of the monocotyledons', Dahlgren *et al.* (1985) proposed to split Liliaceae into more than 20 new families, which were further placed in 5 different orders (Asparagales, Burmanniales, Dioscoreales, Liliales, and Melanthiales). The family Liliaceae itself is in fact no longer represented by any indigenous taxa in Africa south of the Sahara – only by introduced representatives of the genus *Lilium*. The family in its widest sense has rather conservative and primitive flower structures. With cladistic terminology we might say that the family in its traditional circumscription constituted a huge paraphyletic (possibly even polyphyletic) assemblage, defined only by primitive (plesiomorphic) traits. Such families have to be redefined to give monophyletic entities.

In recent publications of Floras of tropical Africa, this

Dahlgren system has to a large extent been accepted (e.g. Flore du Cameroun, Flore du Gabon, Flora of Ethiopia and Eritrea, Flora of Somalia, Flora of Tropical East Africa, and Flora Zambesiaca).

After the publication of Dahlgren's classification, DNA studies have become increasingly important. As a result of these, several taxonomic changes have been proposed (by the so-called Angiosperm Phylogeny Group), and one might say that the monocot systematics are still in flux. There is a tendency now to merge the some of the former Liliaceae split-off families again, but no consensus is reached. We have therefore decided to stick to the family concept of Dahlgren as also used in the mentioned floras.

In taxonomy, the aim is to have taxonomic groups that are monophyletic. This means that all members of the group are considered to have one common ancestor, and that all offspring from this ancestor should be included in the group. The monophyletic group including all the lilies also includes the orchids. The orchids, however, are so diverse and so particular in many respects, and the Ethiopian ones have got a book on their own (Field Guide to Ethiopian Orchids, Sebsebe Demissew *et al.* 2004).

Key to the families

Families treated in this book are in bold.

1. Tepals situated below the ovary. 2
 - Tepals situated above the ovary 13
2. Leaves reduced to scales or spines, their function often fulfilled by modified green branches (cladodes), which sometimes are leaflike (phylloclades) **Asparagaceae (p. 289)**
 - Leaves in rosettes or along climbing stems 3
3. Climbing plants with leathery heart-shaped leaves, stems often prickly **Smilacaceae (p. 321)**
 - Non-climbing herbs with rosettes of linear to lanceolate leaves which are not leathery 4
4. Plants either with a woody trunk and leaves in rosettes at ends of branches or with short stems producing leaves in clumps, leaves with fibers; fruit a berry **Dracaenaceae (p. 274)**
 - Plants without a woody trunk (or if with a trunk, then leaves are fleshy and without fibers, i.e. *Aloe*); fruit a capsule 5
5. Inflorescences on leafy scapes 6
 - Inflorescences on leafless scapes 8
6. Plants with bulbs, cultivated only Liliaceae
 - Plants with rhizomes, corms or tubers 7
7. Ovary with 3 free styles **Colchicaceae (p. 210)**
 - Ovary with 1 style **Anthericaceae (p. 127)**
8. Plants with 1–3 leaves, small yellowish flowers, hairy seeds **Eriospermaceae (p. 271)**
 - Plants most often with more than 3 leaves, flowers, white, yellowish or red; seeds never with hairs 9

9. Plants with bulbs 10
 - Plants with corms or rhizomes 11
10. Inflorescence spike or raceme **Hyacinthaceae (p. 183)**
 - Inflorescence umbel-like **Alliaceae (p. 206)**
11. Rhizomes whitish inside; flowers white, sometimes streaked with greenish, brownish or reddish; seeds more or less glossy, black **Anthericaceae (p. 127)**
 - Rhizomes yellowish inside; flowers most often yellow or red, rarely whitish; seeds dull greyish to brownish 12
12. Leaves thick and fleshy; margins usually with spiny teeth; perianth tubular **Aloaceae (p. 42)**
 - Leaves relatively thin, rarely tubular, without spiny teeth; perianth open, star-shaped or tubular **Asphodelaceae (p. 110)**
13. Climbing plants, flowers unisexual, fruits 3-winged **Dioscoreaceae (p. 305)**
 - Non-climbing plants, flowers bisexual, fruits not winged 14
14. Stamens 1; pollen glued to a horn-like structure **Orchidaceae**
 - Stamens 3 or 6; pollen not glued together 15
15. Stamens 3 **Iridaceae (p. 223)**
 - Stamens 6 16
16. Leaves with long petioles, blades much divided; bracts with long hanging appendages **Taccaceae (p. 319)**
 - Leaves sessile or with a short petiole, blades not divided; bracts without long hanging appendages 17
17. Plants with more than 1m long leaves; inflorescence a panicle more than 2 m long **Agavaceae**
 - Plants with leaves less than 1m long; inflorescence less than 1 m long 18
18. Flowers in umbel-like inflorescences (rarely 1-flowered), subtended by two or more spathe-like bracts and borne on naked stems; underground part a bulb **Amaryllidaceae (p. 162)**
 - Flowers solitary or in racemes, subtended by small bracts; underground part a rhizome or a corm 19
19. Herbaceous geophyte, flowers yellow **Hypoxidaceae (p. 260)**
 - Woody plants, stems clothed with persistent old leaf bases, flowers white to pink **Velloziaceae (p. 325)**

ALOACEAE

The members of this family are perennial, with or without a woody trunk. They have thick, usually bright yellow roots (due to the high content of anthraquinones, a yellow pigment characteristic for the families Aloaceae and Asphodelaceae). Most representatives have succulent leaves in a basal rosette, or on the trunk. The flowers are large and showy, usually fleshy, glabrous or hairy, bisexual, and nearly radially symmetric. The perianth is situated below the ovary and consists of six tepals. Septal glands producing nectar are found in the walls that separate the three rooms of the ovary. The ovary develops into a capsule which opens by three slits between these walls. In each room there are two to numerous seeds. The seeds have an extra seed coat (aril) which can easily be peeled off.

This mainly African family includes 7 genera, (*Aloe*, *Chamaealoe*, *Poelnizia*, *Astroloba*, *Lomatophyllum*, *Haworthia*, and *Gasteria*) of which only one, *Aloe*, is represented in the Horn of Africa. It is now often joined with Asphodelaceae.

ALOE L.

The genus *Aloe* was described by Linnaeus in 1753. The south African botanist G.W. Reynolds contributed greatly to the knowledge of this genus through the publication of two large, well illustrated books, one in 1950 covering the southern African species and the second in 1966 covering the tropical African and the Madagascar species. Quite a number of new species were described from Ethiopia in the 1990's and eight additional new species have been discovered since the publication of Volume 6 of Flora of Ethiopia and Eritrea in 1997.

The plants are easily recognised by their rosettes of large, thick, succulent leaves, which are sometimes spotted. The rosettes are situated on the ground or on

trunks up to 2 m. In rare cases, the thick leaves are spaced along a stem rather than crowded in a rosette. In most species the leaves are D-shaped in cross section, but some have leaves more or less V-shaped in cross section. The leaf margin is almost always armed with sharp teeth. The inflorescence is usually branched (occasionally simple), the lower branches sometimes branching again. Each flower is supported by a bract, the shape and size of which are important for the identification of the species. Flower colouration is most often red, orange or yellow, rarely white. The tepals are fused to form a tube (but free to the base in *Aloe steudneri*). The upper parts of the tepals are more or less reflexed. The 3+3 stamens are free, inserted at the base of the ovary, exserted in the flowering stage. The capsule wall is papery or slightly woody when mature. The seeds are irregularly 3-sided to flattened, narrowly to broadly winged.

Distribution and classification

The genus, which includes about 400 species, has its main distribution in Africa south of the Sahara, including Madagascar and the Mascarenes. Few species reach the Arabian Peninsula and Socotra. The genus was introduced by man to the Mediterranean region and the West Indies a long time ago. Several species are now very widely grown as ornamentals in drier, $\pm$ frost free parts of the world.

It has been suggested that the centre of origin for the genus is in the highlands of SE Africa, whence the ancestral aloes spread during the Tertiary era. Southern Africa is particularly rich in endemic species, but also in Ethiopia and Eritrea, it has a high proportion of endemics and near endemics, c. 80%.

In Ethiopia and Eritrea, 40 species of *Aloe* were known during the first edition and six more species (*A. benishangulana*, *A. clarkei*, *A. elkerriana*, *A. ghibensis*, *A. welmelensis* and *A. weloensis*) have been described in the last seven years making a total to 46 species so far. It is also interesting to note that most species have a very local distribution. Exceptions are for example *A. macrocarpa*, which is distributed in a belt from Somalia to West Africa, *A. parvidens* and *A. ruspoliana* and *A. lateritia* extending to Tanzania and and *A. secundiflora* extending to Rwanda, and *A. retrospiciens* and *A. trichosantha*, on the Horn of Africa. The endemic taxa fall more or less into four main geographical areas in Ethiopia and Eritrea. The first group of 16 endemics is restricted to

the northern and central highlands, north and west of the Rift valley (for example *Aloe elegans*, *A. pulcherrima*, and *A. debrana*). The second group includes 9 species which are restricted to the eastern and SE highlands and lowlands (for example *A. elkerriana*, *A. harlana*, *A. mcloughlinii* and a newly described *A. welmelensis*). The third group of 6 endemics (for example *Aloe gilbertii*, *A. otallensis*, and *A. friisii*) are mainly restricted to the southern parts. The fourth group that includes 4 species (*Aloe clarkei* and *A. kefaensis*, and the newly described *A. benishangulana* and *A. ghibensis* that belong to the western parts of Ethiopia).

Reproduction The aloes have long tubular, most often red to yellow flowers, producing considerable amounts of nectar, all traits indicating typical adaptations to bird pollination. The different aloe species have different flowering periods; some flower over an extended period, thereby offering a continuous food supply for nectar feeding birds. Accordingly the aloes make an important contribution to the bird biodiversity of Ethiopia, especially for the sun birds. At the same time, the birds are vital for the pollination of the flowers and seed set.

The flowers are slightly protandrous, which means that the pollen grains mature and are released before the stigma becomes receptive, thereby the flowers avoid self-pollination. When a bird arrives to enjoy the nectar in a flower, it will either get powdered with pollen or deposit pollen from earlier flower visits on the stigma.

The stiff erect capsules are only open in the upper part. This hampers an easy fall-out of the seeds. A strong wind or a strong kick is required to release or eject the seeds. These processes ensure that the seeds are thrown some distance from the mother plant. The function of the thin arils covering the seeds is not clearly understood.

In addition to reproduction by seeds, several species have the ability to produce lateral rosettes that may develop into independent individuals by fragmentation. The new plantlets are capable of producing new roots, and this is an important factor for maintaining the populations. This is often seen in the spatial arrangement of the individuals, which occur in clusters.

Chemistry and use Aloe, the term here referring to the dried latex extracted from the leaves, has figured in the civilizations of Africa, Asia, Europe and the Middle East for thousands of years.

Plants producing "*Aloe vera*" juice are these days being grown in the Mediterranean region, the southern part of North America, and the West Indies. The species "*Aloe vera*" has an uncertain origin, but the name is probably synonymous with *A. barbadensis* from the Caribbean area. This species must originally have been introduced from the Old World, probably Africa, but its origin has not yet been sorted out. In South Africa, *Aloe ferox* is highly valued and used in a similar way as *A. vera*.

Aloe species have been used for a long time in folk medicine for the treatment of constipation, burns and dermatitis. Recently, some species of *Aloe*, especially relatives of species numbers 1 to 6 below, have been used in a wide range of skin and hair care products, and also form the basis of health drinks and tonics. The slimy gel inside the leaves consists of a complex mixture of polysaccharides, amino acids, minerals, trace elements and other biologically active substances, such as enzymes. *Aloe* species have been the source of laxative drugs, the main purgative principle being an anthrone-C-glycoside, *aloin*, which occurs at levels of between 18 and 30% of the dried product (British Pharmacopoeia 1993, United States Pharmacopoeia 1995). Recent research has indicated that aloe might kill the bacteria responsible for tuberculosis, *Mycobacterium tuberculosis*, and also the herpes virus causing herpes genitalis. Research has further shown that aloe inhibits growth of many common organisms such as yeasts, fungi, and bacteria infecting wounds.

Except for analyses of some chemical compounds undertaken by Professor Ermias Dagne and his group at the Chemistry Department in Addis Ababa University, little is known about the chemistry of the Ethiopian species. There are obviously several interesting aspects of the Ethiopian *Aloe* species that need further study, and the endemic Ethiopian aloes represent an economic potential.

Conservation Many species of *Aloe* are threatened due to habitat destruction caused by urban and regional developments. Elsewhere in Africa a few species are collected for their use in medicine and the cosmetic industry, and these might be threatened by harvesting. Another important concern is that many species have very restricted areas of distribution and occur only in small populations. The aloes may also be a target for succulent enthusiasts in

their quest for rarities. All species of *Aloe* (except *A. vera*) are in the CITES (Convention on International Trade on Endangered Species) list, clearly indicating their vulnerability.

Aloes are keystone species in the ecosystem, being perennial plants, able to tolerate extreme environmental conditions and provide important source of shelter, nectar food and moisture, especially for birds. It is thus imperative to document information on the biology, ecology, distribution and chemistry of these species in order to take appropriate measures to conserve and promote sustainable use of these botanical treasures. Due to the size and succulence of these plants, herbarium material of this group is often poorly prepared. It is however, possible to collect herbarium specimens in a non-destructive manner by removing only the inflorescence and a few representative leaves. It is vital to have information on the overall size and habit of the plant and to take precautions to ensure that herbarium material dries reasonably quickly. Leaves should be split length-wise, keeping the upper surface and margin intact if possible, and all the central water storage tissue scraped away (V-shaped leaves also need to be split along the middle), after which drying is easier. If this is not done, leaves can take weeks, even months, to dry, and often rot or discolour badly. Flowers are best preserved by dipping in petrol or boiling water, or they may be placed in a deep freezer. If this is not done most flowers will drop off and there is excessive shrinkage and distortion. Good photos are important supplements to herbarium material.

Key to the species

Some of the species are closely related and might be difficult to differentiate from each other in herbaria collections. All measurements in the keys are based on dried material and are thus often smaller than those for fresh material. Shrinkage of the very fleshy flowers is significant, usually about 20(25)% in well pressed flowers. Marginal teeth of the leaves are counted towards the leaf base.

1. Perianth and bracts shortly hairy or papillate; racemes commonly over 40 cm long, erect, inflorescence unbranched or with up to 4 lateral racemes 2
- Perianth and bracts glabrous; Racemes up to 35 cm long, usually less, inflorescence often profusely branched, rarely with fewer than 4 racemes 7

2. Perianth and bracts shortly hairy; perianth (20–)23–40 mm long 3
 - perianth and bracts minutely papillate; perianth 15–21 mm long 6
3. Bracts spreading or gently recurved 4
 - Bracts at anthesis sharply reflexed from base; pedicels up to 8 mm long 1. *A. trichosantha*
4. Adult leaves prominently spotted; bracts 3–4 mm wide 5
 - Adult leaves without spots (juvenile plants sometimes profusely spotted); bracts 6–14 mm wide 2. *A. pubescens*
5. Leaves not inrolled; leaves without spines on the lower surface; perianth greenish yellow or grey-green 3. *A. citrina*
 - Leaves inrolled; 3–4 spines on the lower surface of leaves; perianth coral red 4. *A. bertemariae*
6. Marginal teeth c. 3 mm long; perianth (18–)20–21 mm long, outer lobes free c. 1/3 of length 5. *A. eumassawana*
 - Marginal teeth almost absent; perianth c. 15 mm long, outer lobes free c. 2/3 of length 6. *A. scholleri*
7. Flower buds with subglobose basal swelling constricted into narrower tube; leaves very soft, always with longitudinal lines and usually profusely spotted 8
 - Flower bud clavate, cylindrical or conical, sometimes $\pm$ 3-angled; leaves various but if spotted then rather hard in texture and not with longitudinal lines 11
8. Leaves lanceolate to ovate, over 5 cm wide and/or less than 5 times as long as broad; marginal teeth up to 24 per 10 cm, 2–4.5 mm long 9
 - Leaves linear-oblong, up to 2 cm wide, more than 8 times as long as broad; marginal teeth 28–40 per 10 cm, up to 1.5 mm long 10. *A. ellenbeckii*
9. Bracts 2–5 mm long; Perianth 21–23 mm long; fruit c. 18–20 mm long; known only from near Dessie in Welo 7. *A. weloensis*
 - Bracts 6–20 mm long; perianth 20–35 mm; capsule 25–40 mm long; known from Sidamo and Kefa except the widespread *A. macrocarpa* 10.
10. Leaves very fleshy; basal swelling of perianth well developed, globose (widespread in the drier highlands and lowlands) 11
 - Leaves much more fleshy than typical for the genus, spotting rather sparse, sometimes absent; basal swelling of perianth not as clearly globose as in other related species; known only from Kefa in the wild and cultivated in Addis 11. *A. kefaensis*
11. Leaf margin with 10–24 teeth per 10 cm; capsules ellipsoidal, 25–40 mm long 8. *A. macrocarpa*

- Leaf margin with 8–10 teeth per 10 cm; capsules cylindrical, 37–40 mm long
9. *A. lateritia*
- 12. Marginal teeth 0.3–1.5 mm long, sometimes $\pm$ obsolete; leaves always very soft and thin-skinned, pale grey-green, sometimes yellowish, rarely obscurely spotted 13
- Marginal teeth 1.5–5.5 mm long, usually dark-tipped; leaves various but never as thin-skinned, often dark green and/or clearly pale spotted 16
- 13. Plants stemless; growing in *Combretum-Terminalia* woodland in fire prone areas and restricted to near Assosa 12. *A. benishangulana*
- Plants with stems (occasionally without in *A. ruspoliana*); growing in *Acacia-Commiphora* woodland or in dry afro-montane forest and grassland 14
- 14. Stem suckering freely from base; leaves smelling strongly of mice when cut; marginal teeth minute but many and well defined; perianth yellow, up to 20 mm long (found between 300 and 1450 m) 15
- Stems branching dichotomously at apex within leaf rosette; leaves without such smell when cut; marginal teeth almost lacking, traces widely spaced; perianth red, 32–33 mm long (found between 2480–2700 m) 25. *A. pulcherrima*
- 15. Plants stemless or, rarely, with stems to 50 cm long; inflorescence erect, long pedunculate, 100–200 cm high; bracts c. 3 mm long 13. *A. ruspoliana*
- Plants with stout erect stems 1–2 m high; inflorescence spreading, short-pedunculate, up to 45 cm long; bracts c. 5 mm long 14. *A. retrospiciens*
- 16. Leaves dark green with prominent white spots, skin thick so leaf hard textured 17
- Leaves unmarked, rarely grey green and obscurely spotted, skin thin or thick 22
- 17. Leaf surface smooth, glossy; bracts acuminate to acute, relatively inconspicuous 18
- Leaf surface rugulose, rough to the touch; bracts $\pm$ obtuse, prominently white, scarious 18. *A. rugosifolia*
- 18. Plants stemless or nearly so; inflorescence always branched 19
- Plants with distinct slender stems to 20 cm long; inflorescence not branched 46. *A. vituensis*
- 19. Leaves always spotted, dark green, margin pale, only tips of teeth brown and horny; perianth glaucous pink or pale yellow to red; bracts 3–10 mm long 20
- Leaves only occasionally spotted, bright, glossy green, with brown horny margin continuous between teeth at least in places; perianth red or bright yellow; bracts 9.5–15 mm long 19. *A. harlana*

20. Marginal teeth 3–5.5 mm long; perianth 18–26 mm long, not glaucous, clearly striped 21
 - Marginal teeth 1–2.5 mm long; perianth 26–30 mm long, glaucous, obscurely striped 17. *A. parvidens*
21. Perianth broadest at base, 17–20 mm long, pink 15. *A. mcloughlinii*
 - Perianth cylindrical to subclavate, (20–)23–25 mm long, yellow or orange (rarely grey red) 16. *A. pirottae*.
22. Plants stemless or with stout, completely prostrate or pendent stems, rarely some old plants with short erect stems covered with persistent leaf bases 23
 - Plants soon developing obvious erect or ascending stems and eventually forming shrubs 36
23. Inflorescence a much branched panicle with spreading, one sided (secund) racemes 24
 - Inflorescence with erect, radially symmetrical racemes, often little branched 26
24. Marginal teeth with minute brown tip only; perianth (23–)25–26(–32) mm long, not pale flecked, base truncate 25
 - Marginal teeth mostly dark brown, often with colour continuous along margin; perianth 19–23 mm long, white flecked (visible only in fresh material), base rounded 28. *A. secundiflora*.
25. Plants only occasionally stemless; leaves deeply canaliculate, dull grey green 36. *A. gilbertii*.
 - Plants nearly always stemless; leaves shallowly canaliculate towards the tip only, dull olive to brownish green 27. *A. rivae*
26. Perianth cylindrical or clavate (widest towards tip), relatively slender 27
 - Perianth conical-trigonous, very fleshy, widest very near to the $\pm$ truncate base and prominently indented above so as to be $\pm$ 3-sided 26. *A. trigonantha*
27. Flower buds cylindrical or nearly so 28
 - Flower buds distinctly clavate 35
28. Plant suckering from base; leaves not or only slightly glaucous, margins with sharp teeth over 2 mm high; dead leaves brown 29
 - Plant often unbranched, branching when present dichotomously at tip within leaf rosette; leaves pale blue green, margins $\pm$ smooth (teeth widely spaced, less than 0.3 mm high), reddish at least in dry season; dead leaves dark purple 25. *A. pulcherrima*

29. Leaves spreading or recurved; inflorescences ascending, sometimes much branched, racemes less than 30 cm long; tepals without obviously pale margins (inland) 30
- Leaves incurved or erect; inflorescences erect, little branched, racemes up to 35 cm long; tepals with margins prominently pale so flower looks striped (near sea coast in Eritrea) 5. *A. eumassawana*
30. Inflorescence with 1–6 racemes; perianth 35–40 mm long (plants of high altitudes, >2600 m, often growing on cliffs) 31
- Inflorescence with 5 to many racemes; perianth 15–34 mm long (various altitudes, rarely if ever growing on cliffs) 32
31. Outer perianth lobes $\pm$ free (in Tigray, Gonder and Gojam, and in Eritrea) 23. *A. steudneri*
- Outer perianth lobes all joined for 15–20 mm (in Shewa) 24. *A. ankoberensis*.
32. Leaves with horny margin continuous between teeth at least in places; leaves glossy green, sometimes spotted; populations with a significant proportion of yellow flowered plants 33
- Leaves with pale margin, only the marginal teeth horny brown or reddish; leaves often glaucous, never glossy nor spotted, except obscurely when seedlings; yellow flowered plants extremely rare 34
33. Bracts 9.5–15 mm long (in Harerge) 19. *A. harlana*
- Bracts 20–22 mm long (in Tigray and Welo) 20. *A. monticola*
34. Bracts (8–)10–16(–20) mm long; leaves slightly glaucous; inflorescences with just one level of branching (in Eritrea, Tigray and Gonder) 21. *A. percrassa*
- Bracts 3.5–6.5 (–8.5) mm long; leaves not glaucous; inflorescences often with two levels of branching (in Shewa, Gojam and Welo) 22. *A. debrana*
35. Leaves spreading or recurved; bracts conspicuously white and scarious, longer than pedicels; buds erect till just before anthesis; perianth segments with distinctly raised rugose midribs 29. *A. otallensis*
- Leaves erect or incurved; bracts inconspicuous, much shorter than pedicels; buds horizontal for most of their development; perianth segments smooth 30. *A. elegans*
36. Leaves up to 2 cm wide, $\pm$ linear; inflorescence a simple unbranched raceme 45. *A. jacksonii*
- Leaves 5 cm or more wide (if less than 5 cm wide, lanceolate, never linear; inflorescence usually much branched) 37
37. Perianth clavate, broadest near tip 38
- Perianth cylindrical to cylindrical-trigonus 41
38. Bracts 7–12 mm long; perianth 23–27(–33) mm long 39

- Bracts 3–6 mm long; perianth 17–22 mm long 40
- 39. Racemes 12–22 cm long; bracts 9–12 × 2.5–4 mm 32. *A. adigratana*
- Racemes 5.5–8.5(–14) cm long; bracts 7–8 × 2 mm 33. *A. sinana*
- 40. Leaves up to 60 cm long, often less, green, spotted whitish at least near base (in Eritrea, Tigray and Welo) 31. *A. camperi*
- Leaves ca. 80 cm long, uniformly grey green, not spotted (in Gamo Gofa and Sidamo) 34. *A. calidophila*
- 41. Inflorescences with 4 or more racemes 42
- Inflorescence with up to 3 racemes; restricted to parts of the Blue Nile gorge system, near Debre Llibanos 37. *A. schelpei*.
- 42. Dwarf plant ca. 30 cm long; leaves up to 18 cm long; marginal teeth hooked and pointing to leaf apex; restricted to SW Kefa bordering the Elimi triangle bordering Sudan 39. *A. clarkei*
- Plant scandent, if erect more than 40 cm long; leaves > 25 mm long; marginal teeth absent to 2 mm long or if > 3 mm long, spreading, not hooked; widespread in central, southern and eastern Ethiopia 43
- 43. Flowers arranged to one side (secund) or almost so; pedicel 5–8 mm long 44
- Flowers arranged in all sides; pedicel 10–17 mm long 45
- 44. Stems stout 5–7 cm wide; leaves 5–10 cm wide; marginal teeth 3 mm long, white with brownish tip 38. *A. ghibensis*
- Stems slender, 1.8–2 cm wide; leaves 2–4 cm wide; marginal teeth < 1 mm long 46
- 45. Flowers arranged all to one side (secund); perianth pink, outer lobes open for 10–12 mm long 42. *A. welmelensis*
- Flowers mostly arranged to one side, not all (subsecund); perianth yellow, outer lobes open for 5–6 mm long 40. *A. friisii*
- 46. Perianth 20–22 mm long; pedicel 8–12 mm long 47
- Perianth 25–28 mm long; pedicel up to 17 mm long 48
- 47. Stem diameter 0.5–1 cm wide; leaf teeth 0.5–1 mm long; racemes 3–4; flowers lax 1–3 flowers per cm 43. *A. tewoldei*
- Stem diameter 3–4 cm wide; leaf teeth ca. 3 mm long; racemes 8–10; flowers dense 6–10 flowers per cm 41. *A. yavellana*
- 48. Stems scandent, slender 3–5 m long, 1–2 cm wide; leaf teeth 1–2 mm long, whitish-pink; inflorescence with 4–5 racemes 44. *A. elkerriana*
- Stems stout, mostly erect 50 cm to 2 m long, 5–7 cm wide; leaf teeth 3–6 mm long, pinkish to brownish; inflorescence with 6–25 racemes 49

49. Leaves strongly recurved, impossible to dry flat, marginal teeth 5–6 per 10 cm of leaf margin; pedicels 12–17 mm long **35. *A. megalacantha***
- Leaves only slightly recurved, relatively easy to dry flat, marginal teeth 7–12 per 10 cm of leaf margin; pedicels 9–10 mm long **36. *A. gilbertii***

1. *Aloe trichosantha* Berger

The specific epithet '*trichosantha*' refers to the hairy (*trichos*-) flowers (*anthos*). The species was described by Berger in 1905. The type material was collected in the Ghinda valley between Asmera and Mitsiwa (Massawa) in Eritrea.

This species belongs to a small group of Ethiopian/Eritrean aloes (numbers 1–6) with pubescent or papillate flowers, a group to which *A. vera* might be related. The group includes: *A. trichosantha*, *A. pubescens*, *A. citrina*, *A. bertemariae*, *A. eumassawana*, and *A. schoelleri*. *A. trichosantha* is distinguished from the other species in the group by its sharply reflexed bracts. Like *A. bertemariae* it has relatively short pedicels, only up to 8 mm long. *A. bertemariae* has leaves inrolled, spotted and with spines on the lower parts.

Description Rosettes stemless, solitary or suckering to form groups. Leaves 12–20 per rosette, 25–70 × 2.5–13.5 cm, suberect with slightly incurved tips, slightly canaliculate, dull grey green without spots in adult plants, juveniles densely pale spotted. Marginal teeth 4–12 per 10 cm, 2–5 mm long with brown tip. Inflorescence up to 2 m high, erect, with 1–3(–4) racemes. Racemes 40–70 cm long, cylindrical-conical, dense (2–3 flowers per cm). Bracts lanceolate, 10–19(–23) × 4–8 mm, finely pubescent, sharply reflexed after flowering. Pedicels 2.5–8(–11 in fruit) mm long. Perianth cylindrical-trigonous, curved slightly upwards towards tip, 20–30 mm long, 4.5–6.5(–7) mm wide when pressed, pale to bright pink with short, sometimes dense, white indumentum; outer lobes free for 6–9 mm. Capsule 19–23 × 7.5–8 mm. Seeds 3-angled, 4.5–6 mm long, brown to almost black with pale spots and narrow pale wings.

Subspecies The species is subdivided into two subspecies based on the density and length of the teeth along the leaf margin and the length of the flower. The differences between the subspecies are small, but consistent enough to justify subspecific rank. In our present knowledge, there is a wide gap between the distribution areas of the two subspecies. Thus the species should be looked for in this



Fig. 21. *Aloe trichosantha* ssp. *trichosantha*, from Shewa, near Sodere.

gap, particularly in the poorly known eastern escarpments of Ethiopia.

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1. Marginal teeth 8–12 per 10 cm, 4.5–5.5 mm long; perianth 20–23 mm long. a. subsp. *trichosantha*
 - Marginal teeth 4–8 per 10 cm, 2–4 mm long; perianth (23–)25–30 mm long. b. subsp. *longiflora*
-



Aloe trichosantha
ssp. *trichosantha*



Aloe trichosantha
ssp. *longiflora*

a. subsp. *trichosantha*

This subspecies grows in open dry bushland between 900 and 1700 m in Tigray floristic region in Ethiopia and in Eritrea. It may also occur in the Sudan. The main flowering period is in the dry season, from February to May.

b. subsp. *longiflora* Gilbert & Sebsebe

The subspecific epithet '*longiflora*' refers to the relatively long (*longi*) flowers (*flora*), at least compared to the other subspecies. It was described with the type material collected west of Daletti in Harerge by Gilbert and Sebsebe in 1997.

This subspecies is widespread in Ethiopia and grows abundantly in open deciduous bushland on volcanic rocks and alluvial soils between 1000 and 1950 m. It is not known anywhere else. The flowering period is almost throughout the year, with records from August to May.



Aloe pubescens

2. *Aloe pubescens* Reynolds

The specific epithet '*pubescens*' refers to the hairy inflorescence and flowers. It was described in 1957. The type material was collected near Shashamene in Shewa region and cultivated in Pretoria.

This species belongs to a small group of Ethiopian/Eritrean aloes (numbers 1–6) with pubescent or papillate flowers. It differs from its related species by its bracts, which are more than 5 mm wide.

Description

Rosettes stemless (in cultivation with stems to 30 cm long), usually suckering freely to form groups. Leaves *c.* 16, 35–45 × 6–13 cm, suberect with slightly recurved tips, grey green without markings (except in seedling plants). Marginal teeth 8–11 per 10 cm, 2–3.5 mm long, upper half reddish-brown. Inflorescence 0.7–1.5 m high with 1–2(–3) racemes. Racemes 20–35 cm long, cylindrical-conical, dense (3–5 flowers per cm). Bracts ovate-triangular, 15–21 × 6–14 mm, acute. Pedicels 12–20 mm long. Perianth similar in form to that of *Aloe trichosantha*, 33–40 mm long, 4–5 mm wide when pressed, minutely pubescent, pink; outer lobes free for *c.* 12 mm. Capsule 21 × 7.5 mm, ellipsoidal. Seeds ± blackish, 3 angled/ winged, 5 mm long, wing 1.2 mm wide, densely dark veined.

Habitat and distribution

The species grows along rocky stream banks, often in areas with remnants of *Podocarpus* forest, and along field margins, from 1800 to 2550 m in Shewa and Ha-



Fig. 22. *Aloe pubescens*, from near Kobo, Harerge floristic region.

rergerge floristic regions. The main flowering period is in the dry season, from February to May.

Notes Plants from the Harerge floristic region that belong to the species have somewhat narrower bracts and shorter pedicels than the Shashamene ones, but intermediates are found from north of Butajira in Shewa region. Hence, no proper subdivision of the species can be made.

*Aloe citrina*

3. *Aloe citrina* Carter & Brandham

The specific epithet '*citrina*' refers to the lemon-yellow (*citrina*) colour of the flower. It was described in 1983 with the type material collected from Somalia.

The species belongs to the small group of Ethiopian/Eritrean aloes (numbers 1–6) with pubescent and papillate flowers. It is distinguished from the other members of the group except *A. bertemariae* by its prominently spotted leaves, the relatively long pedicels (more than 8 mm long), and the yellowish to greenish flowers. The grey-green to greenish yellow flowers and leaves without spines on the lower parts separates *A. citrina* from *A. bertemariae*.

Description

Rosettes stemless, solitary or in small groups. Leaves dense, ca. 16, erect to slightly incurved, $36\text{--}60 \times 8.5\text{--}12$ cm, pale grey green with numerous pale spots often in $\pm$ transverse bands, canaliculate. Marginal teeth 5–9 per 10 cm, 1.5–3 mm long with brown tips. Inflorescence to 2 m high with 2–6 racemes. Racemes (25–)40–50 cm long, cylindrical-conical, dense (2–5 flowers per cm). Bracts lanceolate-triangular, $8\text{--}14 \times 3\text{--}3.5$ (–4) mm, finely pubescent. Pedicel 8.5–15 mm long. Perianth similar in form to that of *A. trichosantha*, 26–34 mm long, 4–4.5 mm wide when pressed, grey-



Fig. 23. *Aloe citrina*, from near Dolo Odo, Sidamo floristic region.

green to greenish-yellow, tomentose; outer lobes free for 14–18 mm. Capsule 22–24 mm long, cylindrical.

Habitat and distribution

A. citrina grows in open deciduous bushland on sandy soils from 275 to 1000 m in Sidamo region. It also occurs in Somalia and northern Kenya. The flowering is bimodal, in the rainy seasons from September to December and from May to June.



Aloe bertemariae

4. *Aloe bertemariae* Sebsebe & Dioli

The specific epithet '*bertemariae*' is given in honour of Ms Berte Maria Ulvester, who is the wife of one of the authors of the species (Dioli), and who gave support for a botanical expedition in Ogaden. It was described in 2000 with the type material collected from Guddis Village on the way to Imi in the Harerge floristic region.



Fig. 24. *Aloe bertemariae*, from Guddis in Harerge floristic region. Plate obtained from Kew Bulletin.

The species belongs to a small group of Ethiopian/Eritrean aloes (numbers 1–6) with pubescent and papillate flowers. It is easily separated from other members of the group except *A. citrina* by its spotted leaves. It is distinguished from *A. citrina*, by its inrolled leaves that become tubular in dry conditions, 3–5 spines on the lower surface of the leaves, and the dark coral red perianth.

Description Rosettes stemless, solitary or suckering to form small groups of 3–4. Leaves 13–15, erect to slightly incurved, strongly inrolled, becoming tubular in dry condition, 50–65 × 8–9 cm, longitudinally striped and with profuse whitish green blotches. Marginal teeth 4–6 per 10 cm, 1–2 mm long; lower surface of most leaves bearing 3–5 spines. Inflorescence 1–2 m long, raceme simple, 50–80 cm long, cylindrical-conical, with 3 flowers per cm. Bracts triangular, acuminate at apex, whitish on the sides, 9–12 × 3–4 mm. Pedicel 4–7 mm long. Perianth dark-coral red, cylindric-trigonus, 20–23 mm long, *c.* 2.5 mm wide when pressed, minutely pubescent; outer lobes free for 1/3 of their length.

Habitat and distribution The type locality in Harege floristic region is in an area of *Acacia* woodland on sandy soil between 300 and 400 m. It is so far not known from anywhere else. The main flowering period is from November to December.



Aloe eumassawana

5. *Aloe eumassawana* Carter, Gilbert & Sebsebe

The specific epithet '*eumassawana*' refers to the true Massawa aloe (the single known wild locality for the species). The species was described in 1996 with the type material collected from Arkiko near Massawa in Eritrea.

The species belongs to a small group of Ethiopian/Eritrean aloes (numbers 1–6) with pubescent and papillate flowers. It is easily recognised from other members of the group by its short (18–21 mm long) perianth which is papillate, not pubescent.

Description Rosettes stemless or nearly so, suckering to form large clusters. Leaves *ca.* 16, 45–50 × 7–18 cm, tips slightly incurved to slightly recurved, shallowly canaliculate, dull grey green and sometimes with a few pale spots. Marginal teeth 5–6(–7) per 10 cm, *ca.* 3 mm long, reddish-brown only at the tips. Inflorescence erect, 1.2–1.5 m high with 1–3 racemes. Racemes (15–)20–25 cm long, cylindrical-conical, dense, 4–8 flowers per cm. Bracts 6.5–7 × 2.5–4 mm. Pedicels 3–4.5(–7) mm long. Perianth cylindrical trigonous, (18–)20–21 mm long, *ca.* 7 mm wide when pressed, pale scarlet or orange with pale lobe margins; outer lobes free for 12–15 mm.



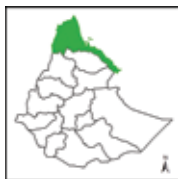
Fig. 25. *Aloe eumassawana*, from Arkiko (Hargigo), Massawa, Eritrea

Habitat and distribution

In the wild, the species is known from a small area of coastal bushland with succulent euphorbias and cacti on sandy soil near sea level at Arkiko in the Massawa area, and on the adjacent Dahlak Islands of Eritrea. It is also recently found occurring in Djibouti. The main flowering

Notes

period is from November to March. The species was previously known by the name *A. massawana* which was described by Reynolds in 1959 based on Tanzanian material. Reynolds believed the Tanzanian plants were introduced from the Red Sea coast of Eritrea.



Aloe schoelleri

6. *Aloe schoelleri* Schweinfurth

The specific epithet '*schoelleri*' probably refers to Mr. Max Schoeller, an explorer who accompanied G. Schweinfurth on a trip to Eritrea in 1891. We assume Schweinfurth wanted to acknowledge and honour the friendship by naming the species after him. The species was described in 1894, with the type material collected from the Kohaito Plateau in Eritrea.

This is a species with inadequate information about its habit. It might be related to a small group of Ethiopian/



Fig. 26. *Aloe schoelleri*, from Kohaito plateau, Eritrea.

Eritrean aloes (numbers 1–6) with pubescent and papillate flowers. The description of the inflorescence seems to indicate a relationship with *A. trichosantha*, but in *A. trichosantha*, the whole inflorescence is pubescent. In addition, the perianth segments are free to $> 2/3$ of their length. The shape of the perianth might further suggest a relationship with *A. steudneri* (see below). Recently Gebrehiwot Medhanie & Dioli (2006) have found the species in the wild.

Description Rosettes with stems c. 30 cm long and 8 cm thick in older plants and stemless in young ones. Leaves 40–52 × 9–14 cm. Marginal teeth rarely present. Inflorescence solitary, 50–60 cm long, raceme ca. 30 cm long. Bracts large, rhomboidal to obovate, 14–17 × 9–10 mm, acute at the apex, papillate. Racemes densely crowded, pedicels in very young perianth parts short, immature ones ca. 10 mm long, reddish. Bracts and tepals are partly papillose. Mature flowers not known, but the perianth segments is free to more than $> 2/3$ of the length.

Habitat and distribution The species is only known from the Kohaito Plateau in Eritrea, and occurs at altitudes of c. 2600 m. The flowering period is from February to April and may extend to July.



Aloe weloensis

7. *Aloe weloensis* Sebsebe

The species epithet, '*weloensis*' refers to the "Welo floristic region" with its central town Dessie from where the type specimen was collected and known distribution of the species so far. The species is described in Kew Bull in 2010.

A. weloensis a member of the group of aloes known as the '*saponaria*' group (numbers 7–11) which have soft and spotted leaves, and a basal swelling of the perianth tube. *A. weloensis* is clearly distinguished from the other Ethiopian members of the group by the narrower perianth at the base.



Fig. 27. *Aloe weloensis*, cultivated, original material obtained from Dessie, Welo floristic region.

Description

Acaulescent, solitary or in clumps of 2–5. Leaves in rosettes up to 35, 20–45 × 5–10 cm, with greenish-white elongate spots, seen both above and below, more conspicuous below. Marginal spines, 1–2 mm long, brownish-tipped, 10–12 per 10 cm length. Inflorescence solitary or two, 55–150 cm long, with 4–6 racemes; raceme cylindrical, 15–25 cm long, lax. Bracts white, ovate-acuminate, 2–5 × 2 mm. Pedicel 10–13 mm. Perianth pinkish-red, 21–23 mm long, base slightly swollen, truncate, 5–6 mm across; outer perianth parts free for 10–11 mm long; stamens and styles exerted 3–5 mm long at anthesis. Fruits 18–20 mm long.

Habitat and distribution

It grows on edges of roads and in disturbed areas between 2440 and 2500 m. It is known so far only from a restricted area outside Dessie towards Addis in Welo floristic region. The main flowering period is between September and November in the wild.



Aloe macrocarpa

8. *Aloe macrocarpa* Todaro

The specific epithet '*macrocarpa*' refers to the large (*macro*-) fruit (*carpa*) size. The species was described in 1875 based on material cultivated from seeds collected in Ethiopia by Schimper in 1870, probably from Tigray region.

A. macrocarpa is a member of the group of aloes known as the '*saponaria*' group (numbers 7–11) which have soft and spotted leaves, and a basal swelling of the perianth tube. *A. macrocarpa* is clearly distinguished from the other Ethiopian members of the group by the numerous pale spots on the leaves, which also have distinct darker longitudinal lines, the perianth with a markedly globose basal swelling and the large capsule (also found in *A. lateritia*).

Description

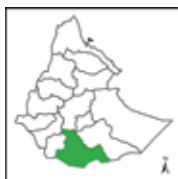
Rosettes stemless, rarely developing short erect stems in shaded sites, solitary or forming small groups. Leaves 16–20, (10–)20–35 × 3–11.5 cm, very soft, green, usually with numerous pale spots, always with distinct darker longitudinal lines. Marginal teeth 10–24 per 10 cm, 2–3 mm long with brown tips. Inflorescence erect, up to 100 cm high. Racemes (1–) 3–5(–7), (2–)4–22 cm long, lax to capitate. Bracts 6–20 × 2–4 mm. Fruiting pedicels 11–45 mm long. Perianth 19–30(–35) mm long, with a distinct globose basal swelling which is 4.5–7 mm wide when pressed, abruptly constricted into a subcylindrical limb 2.3–5 mm wide when pressed. Perianth lobes red with paler margins, very rarely yellow; outer lobes free for 5–6 mm. Capsule cylindrical to ellipsoidal, 22–40 × 12–15 mm.

Fig. 28. *Aloe macrocarpa*, from between Harar and Jijiga, Harerge floristic region.



Habitat and distribution

The species grows in open grassland, often between clusters of evergreen bushes, on rocky slopes to plateau areas with darker soil between 1400 and 2200(–3000) m in many parts of Ethiopia and Eritrea. It is also widespread from Somalia west to Benin. Plants from high altitudes in Arsi region in Ethiopia are much smaller than plants growing at lower altitudes, and they also have more brightly colored capitate inflorescences. The main flowering period in Ethiopia is from October to April.



Aloe lateritia

9. *Aloe lateritia* Engler

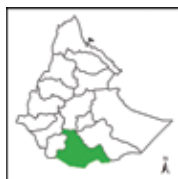
The specific epithet '*lateritia*' refers to the 'dark brick red' flowers. The species was described in 1895 with the type material collected in the Moshi District in Tanzania.

The species is a member of the 'saponaria' group (numbers 7–11). It is closely related to, if not identical with, *A. macrocarpa*. *A. lateritia* is vaguely distinguished from *A. macrocarpa* by the larger vegetative and inflorescence parts.

Description Closely related to *A. macrocarpa*, but rather larger. Leaves up to 60 cm long with marginal teeth 8–10 per cm, 2–3 mm long; inflorescence to 130 cm long; racemes lax to capitate; capsules 37–40 mm long.

Habitat and distribution The species grows in open deciduous bushland at about 1550 m in Sidamo floristic region. It is also known from Kenya, Tanzania, Uganda, Rwanda and Zaire. The main flowering period in Ethiopia is from September to November.

Notes *A. lateritia* shows a very wide variation in the density of the inflorescence, from rather lax racemes to dense heads. Plants with capitate inflorescences have been proposed to belong to a separate species (*A. graminicola*), but the type material of *A. lateritia* has similar dense inflorescences, and there is a continuity of variation between the extremes. Two subspecies have been recognized in Tropical East Africa; only specimens referred to subsp. *graminicola* occur in Ethiopia. The whole complex including *A. macrocarpa* is taxonomically difficult and needs to be revised throughout the range from Ethiopia to South Africa and from East to West Africa.



Aloe ellenbeckii

10. *Aloe ellenbeckii* Berger

The specific epithet '*ellenbeckii*' is given in honour of the German collector, *Ellenbeck* from whose collection the type of the species was designated. The species was described in 1905, based on type material collected from the area at the confluence of Dera and Juba Rivers in Somalia in 1905. *A. dumetorum*, described by Mathew and Brandham from Kenya, is conspecific with *A. ellenbeckii*.

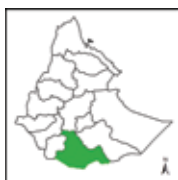
A. ellenbeckii belongs to the 'saponaria' group of aloes (numbers 7–11) with spotted leaves and a basal swelling of the perianth. It is distinguished from the rest of the group by its narrowly linear-oblong leaves, up to 2.5 cm wide, and by the high density of short marginal

teeth (28–40 per 10 cm less than 1.5 mm long).

Description Rosettes stemless, solitary or suckering to form clumps. Leaves 5–10, up to 26×1.6 –2.6 cm, narrowly oblong, canaliculate to cylindrical, green with numerous pale spots. Marginal teeth 22–25 per 10 cm, (0.5–)1.5 mm long, white, sometimes with minute dark tips. Inflorescence and perianth similar to *A. macrocarpa*. Inflorescence 50–75 cm high, racemes (1–)2–3, to 20 cm long, lax. Bracts (5–)11 $\times$ (1.5–)3 mm. Pedicel (7–)20 mm long. Perianth (20–)28 mm long, base 6 mm wide, limb 4.5–6 mm wide.

Habitat and distribution The species grows in partial shelter of bushes in deciduous bushland on limestone at about 1600 m, east of Negele in Sidamo floristic region. It also occurs in northern Kenya. The main flowering period in Ethiopia is from October to November.

Notes Only a few Ethiopian plants have been observed in the wild, and there is a need for more field studies.



Aloe kefaensis

11. *Aloe kefaensis* Gilbert & Sebsebe

The specific epithet '*kefaensis*' refers to the region 'Kefa', where the only known naturally occurring populations are found. This species is widely cultivated in Addis Ababa and Jimma. It was described in 1997. The type material was collected SW of Gibe (Ghibe) River in Kefa floristic region.

The species is a member of the '*saponaria*' group (numbers 7–11). It is distinguished from the other members of the group by the leaves being much less fleshy, the spots on the leaves being much more sparse or even absent, and the basal swelling of the perianth being less distinctly globose.

Description Rosettes stemless. Leaves 35–45 $\times$ 8–11 cm, less fleshy than usual for the genus, green with obscure longitudinal dark lines and few or no pale spots. Marginal teeth 12–19 per 10 cm, 3–4.5 mm long, pale, sometimes with minute dark tip. Inflorescence c. 1.5 m high, little branched. Racemes 30–35 cm long, lax (2–3 flowers per cm). Bracts 11–14 $\times$ 4.5–6 mm. Pedicels 16–22 mm long. Perianth as in *A. macrocarpa*, but with basal swelling not so sharply delimited and not clearly globose, 28–32 mm long, base ca. 6 mm wide and limb 4.5–5 mm wide when pressed.

Habitat and distribution

The species grows in wooded grassland at around 1800 m in Kefa region. It is so far not known anywhere else. The specimen from Gonder, which was thought to belong to this species when the ‘Flora of Ethiopia and Eritrea’ was written, is now confirmed to belong to another species, *A. trigonantha*. The main flowering period is from September to November, occasionally also from February to June.



Aloe benishangulana

12. *Aloe benishangulana* Sebsebe & Tesfaye

The species epithet, ‘*benishangulana*’ refers to the “Benishangul-Gumuz Region” from where the species is known from.

This species and *A. ghibensis* are unique among the Ethiopian Aloes growing in *Combretum-Terminalia* woodland and adapted to occasional fire burning. The species is recognized from a related species, *A. schweinfurthii* Bak. known from Southern Sudan, N Uganda and N Zaire extending to west Africa (Ghana) by the leaves without spots, weak whitish marginal spines 1–15 mm long, bracts *c.* 10 × 4 mm, pedicel 10–11 mm long and capsule 25–27 mm long. In contrast, *A. schweinfurthii* has spotted leaves, spines 3–5 mm long, pedicel *c.* 13 mm long and capsule 17–20 mm long. It is described in Kew Bull. in 2010.



Fig. 29. *Aloe benishangulana*, from Beni-Shangul in Wellega floristic region.

Description Acaulescent, growing in rock crevices or “rock shelters” suckering; rosette coming out between rock crevices or from rock bottoms that partly shelters the lower parts of the aloe plant; root system massive. Leaves, laxly rosulate, $20\text{--}46 \times 1\text{--}4.5$ cm; leaf surface dull green with smooth surface. Marginal teeth $1\text{--}1.5$ mm, white, $3\text{--}8$ mm apart or $10\text{--}12$ per 10 cm length. Inflorescence $50\text{--}60$ cm long, simple raceme cylindrical, c. 28 cm long, Bracts ovate, $8\text{--}10 \times 4$ mm, acuminate at the apex. Pedicel $8\text{--}10$ mm long; Perianth bright scarlet, paler to almost white towards mouth, $37\text{--}40$ mm, base truncate, 8 mm across; outer tepals free for 10 mm long. Capsule $25\text{--}27$ mm long, each part $25\text{--}27 \times 10$ mm.

Habitat and distribution The species grows in Bamboo (*Oxytenanthera abyssinica*) thicket with open rocky outcrops or partially covered by slanting rocks giving them protection during fire season between 1490 and 1500 m close to Assosa in Wellega floristic region. The general area where it grows experiences natural and man made fire regimes. The main flowering period is between April and August.



Aloe ruspoliana

13. *Aloe ruspoliana* Baker

The specific epithet ‘*ruspoliana*’, refers to a Roman prince [“Principe Romano”], Count Eugenio Ruspoli. He was the leader of an expedition in 1893 together with another Italian, Dr. Domenico Riva, to Southern Ethiopia. The type of the species was designated from one of Ruspoli’s collections, and the species was named in honour of him. According to a note written by J. B. Gillett in the Kew Library, Ruspoli was killed by an elephant near the Sagan River in the Gamo Gofa floristic region on 4 Dec. 1893. The species was described in 1898. The type material was collected between Milmil and Imi in Harerge Region.

The species is one of the two *Aloe* species (along with *A. retrospiciens*) whose leaves smell strongly of mice when freshly cut and whose flowers are bright yellow. It is a very distinct species, easily recognised by the soft yellow green leaves with minute marginal teeth.

Description

Rosettes stemless or with decumbent or ascending stems to 50 cm long, suckering to form groups, often quite large. Leaves ca. $16, 37\text{--}60 \times 7.6\text{--}12$ cm, suberect to spreading, very soft, pale yellowish-green, sometimes obscurely pale spotted, not canaliculate. Marginal teeth $0.3\text{--}0.7$ mm long, $14\text{--}30(=60)$ per 10 cm. Inflorescence long pedunculate, $1.2\text{--}2$ m high with 12 or more racemes. Racemes $2\text{--}4$ cm long, subcapitate. Bracts c. 3×1.5 mm. Pedicels 5 mm long. Perianth cylindric-trigonous, $13\text{--}16$ mm long, $4\text{--}5$ mm wide when pressed, yellow; outer lobes free for $5\text{--}6$ mm.



Fig 30. *Aloe ruspoliana*, from Sof Omar in Bale floristic region.

Habitat and distribution

The species grows on open rocky hillsides in *Acacia-Commiphora* bushland between 300 and 1000 m in Sidamo, Bale and Harerge floristic regions in Ethiopia. It is also known from Kenya. The main flowering period in Ethiopia is from September to December.



Aloe retrospiciens

14. *Aloe retrospiciens* Reynolds & Bally

The specific epithet '*retrospiciens*', refers to the flowers lying backwards (*retro-*) on the racemes/spikes (*spiciens*). The species was described in 1958 with the type material collected near Darburruk in Northern Somalia.

The species is one of the two *Aloe* species (including the previous species, *A. ruspoliana*) whose leaves smell strongly of mice when freshly cut and whose flowers are bright yellow. It is a very distinct species, easily recognised by the thick erect stems up to 2 m high and the soft leaves with minute very close spaced marginal teeth.

Berger described a taxon, *A. ruspoliana* var. *dracaeniformis*, from Ogaden in 1908. This taxon clearly belongs to *A. retrospiciens*. The description of this variety under *A. ruspoliana* clearly indicates the close relationship of the two species.

Description

Succulent shrub, stem erect, 1–2 m high, 3–4 cm thick, branching from base. Leaves rather lax, spreading to gently recurved, 25–32 × 5–5.5 cm, grey-green, sometimes flushed red, smelling of mice when cut. Marginal teeth (24–)33–34 per 10 cm, minute, white, c. 1 mm long. Inflorescence c. 45 cm long, divaricately branched with 8–11 racemes. Racemes 2–5 cm long, lax (2–4 flowers per cm). Bracts c. 5 × 2–2.5 mm, scarious. Pedicels 7–8 mm long. Perianth



Fig. 31. *Aloe retrospiciens*, from near Dire Dawa, Harerge floristic region.

cylindrical-trigonal, 15–20 mm long, 5–7 mm wide when pressed, pale yellow; outer segments free for 6–7(– 10) mm.

Habitat and distribution

The species is locally abundant in open deciduous bushland on limestone escarpment around 1000 m in Afar, Bale, and Harerge floristic regions in Ethiopia. It also occurs in northern Somalia. The main flowering period in Ethiopia is from March to April, occasionally also from September to December.



Aloe mcloughlinii

15. *Aloe mcloughlinii* Christian

The specific epithet '*mcloughlinii*' is given in honour of major A. J. McLoughlin from whose collection the type



Fig. 32. *Aloe mcloughlinii*, from Dire Dawa, Harerge floristic region.

of the species was designated. The species was described in 1951 on the basis of living material collected near Dire Dawa in Harerge region in Ethiopia and cultivated in Pretoria, South Africa.

The species is a member of group of spotted aloes (numbers 15–18. Unlike the ‘*saponaria*’ group, this group is characterised by the leaves having tough skins and not having a swollen perianth base. *A. mcloughlinii* is distinguished from the rest of the group by its shorter (less than 20 mm long), pink perianth.

Description

Rosettes solitary or in small groups, stemless or nearly so. Leaves 40–50 × 7–8 cm, ascending to spreading with recurved tips, upper surface convex, dark green with numerous elongated pale green spots; marginal teeth 7–10 per 10 cm, 3–4.5 mm long, with small reddish brown tips. Inflorescences 100–120 cm high, branching above middle, with 6–11 ± erect racemes. Racemes cylindrical, 11–20 cm long, lax (2–3 flowers per cm), sometimes ± secund on branches. Bracts ovate, 3–6 × 2–3 mm. Pedicels 5–9.5(–12) mm long. Perianth cylindrical to slightly conical, 17–20 mm long, 5–7.5 mm wide when pressed, ± truncate at base, pink with paler lobe margins so the flower looks as if it has stripes; outer lobes free for 10–16 mm.

Habitat and distribution

The species grows on flat, stony ground with disturbed *Acacia* bushland, often together with *A. megalacantha* and large *Sansevieria* species, between 1060 and 1250 m in Harerge floristic region. It is so far not known anywhere else. The main flowering period is from April to May.



Aloe pirottiae

16. *Aloe pirottiae* Berger

The specific epithet ‘*pirottiae*’ is given in honour of Prof. Pietro Romualdo Pirotta, who was a Professor of botany in Rome. The species was described in 1905, based on type material collected from the Sagan River in the border area between Gamo Gofa and Sidamo floristic region in Ethiopia.

A. pirottiae is a member of the group of spotted aloes (numbers 15–18) with a tough skin on the leaves. The species is distinguished from the closely related species, *A. mcloughlinii*, by the cylindrical to subclavate perianth which is (20–)23–25 mm long and yellow or orange, rarely reddish. *A. mcloughlinii* has a pink perianth, shorter than 20 mm.

Description Rosettes forming small groups, stemless or nearly so. Leaves 45–60 × 6.5–13 cm, spreading with recurved tips, shallowly canaliculate at least near tip, dark green with many elongated pale green spots. Marginal teeth 7–10 per cm, (3–)4–5.5 mm long, often curved, brown tipped. Inflorescence with up to 28 mostly ± spreading branches. Racemes cylindrical, often secund, 7–33 cm long, lax (2–4 flowers per cm). Bracts ovate, 3–10 × 2–5 mm, acute or acuminate. Pedicel 3–9(–12 in young fruit) mm long. Perianth cylindrical or clavate, 20–28 mm long, 4–5 mm wide when pressed, yellow, orange or sometimes red, ± striped; outer lobes free for 6–12 mm. Capsule small, c. 15 mm long. Seeds ca. 4 mm long, ± 3 winged, brown with white cistoliths and pale wings.

Habitat and distribution The species grows in open *Acacia* woodland, sometimes on dark soil between 1300 and 1820 m in Gamo Gofa, Sidamo, Bale, and Harerge floristic regions. It is so far not known anywhere else. The main flowering period is from November to January.

Notes The species shows clear regional variation. Plants from Harerge have distinctly secund racemes, acute bracts which are 4–6 × 2–3 mm, cylindrical perianths, 23–25 mm long, which are yellow (occasionally orange or red



Fig. 33. *Aloe pirottae*, from near Bitata, Sidamo floristic region.

and striped). The plants from Bale have racemes that are only obscurely secund; the bracts are acute, $8-10 \times 2.5-5$ mm; the perianths are cylindrical, 21–28 mm long, pale yellow. The plants from eastern Sidamo have racemes that are not secund; the bracts are acuminate, 10×4 mm; the perianths are distinctly clavate, 24 mm long, obscurely striped 'grey red'. The plants from western Sidamo and Gamo Gofa have racemes that are subsecund; acute bracts, 3×2 mm; a subclavate perianth which is 20 mm long, and so far the colour is unknown. This variation needs more field observations.



Aloe parvidens

17. *Aloe parvidens* Gilbert & Sebsebe

The specific epithet '*parvidens*', refers to the small sized (*parvi*-) teeth (*dens*) on the leaf margin. The species was described in 1992. The type material was collected SE of Filtu in Sidamo floristic region in Ethiopia.

The species is a member of the group of spotted aloes (numbers 15–18) with tough skins. *A. parvidens* is distinguished from the rest of the group by the small sized marginal teeth (1–2.5 mm long) and the long perianth, up to 30 mm long.

Description

Rosettes solitary or in small groups, stemless or nearly so. Leaves spreading with recurved tips, $25-42 \times 4.5-6.5(-9)$ cm, dark green to almost brown with many elliptical pale spots; marginal teeth 8–13 per 10 cm, 1–2.5 mm long with minute brown tips. Inflorescence up to 1(–1.2) m high, with $4-8 \pm$ erect racemes. Racemes cylindrical, sometimes subsecund, 9–20 cm long, lax (2–3 flowers per cm). Bracts $5-6 \times 3-4.5$ mm, acute. Pedicels 5.5–12 mm long. Perianth cylindrical-trigonous, 26–30 mm long, 4–6 mm wide when pressed, pinkish-red, sometimes $\pm$ glaucous with paler margins to lobes; outer lobes free for 6–10 mm.

Habitat and distribution

The species grows in *Acacia-Commiphora* bushland or woodland in relatively flat areas, often hidden under smaller bushes between 1200 and 1450 m in Sidamo and Bale floristic regions. It also occurs in Kenya and Somalia. The main flowering period in Ethiopia is from April to May, occasionally also from September to October.

*Aloe rugosifolia*

18. *Aloe rugosifolia* Gilbert & Sebsebe

The specific epithet '*rugosifolia*' refers to the wrinkled (*rugosus*) leaves (*folia*) surface. The species was described in 1992. The type material was collected in Northern Kenya.

The species is a member of the group of spotted aloes (numbers 15–18) with tough leaf skins. It is distinguished from the rest of the group by the distinctive finely rugose to rugulose leaf surfaces, a character which is rather unique among the *Aloe* species occurring in tropical Africa and Arabia.

Description

Rosettes solitary or in small groups, stemless. Leaves spreading, recurved in young plants, later erect to incurved, 20–40 × 5.5–8 cm, finely rugose, green with clearly defined pale spots. Marginal spines 10–16 per 10 cm, 4–5 mm long, brown, sometimes almost contiguous. Inflorescence 1.5–1.8 m high, branched with up to 10 racemes. Racemes 10–20 cm long, cylindrical or conical, 7–8 flowers per cm. Bracts 9–11(–13) × 4–8 mm, acute, scarious. Pedicels 5–7 mm long. Perianth subclavate to cylindrical, 25–28



Fig. 34. *Aloe rugosifolia*, a cultivated plant originally collected near Yabello, Sidamo floristic region.

mm long, c. 5 mm wide when pressed, pink; outer lobes free for ca. half length. Capsule 17 mm long. Seed 4 mm long, dark brown with 2 broad white scarious wings to ca. 4 mm wide overall.

Habitat and distribution

The species grows in shelter of bushes in *Acacia-Commiphora* bushland between 1350 and 1700 m in Sidamo floristic region in Ethiopia and also in Northern Kenya. The main flowering period in Ethiopia is from July to September.



Aloe harlana

19. *Aloe harlana* Reynolds

The specific epithet '*harlana*', refers to the locality 'Harla' SE of Dire Dawa in Harerge floristic region, the locality of the type specimen. The species was described in 1957.

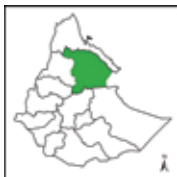
Aloe harlana and the next species *A. monticola* constitute a group of aloes recognised by a brownish cartilagenous tissue along the leaf margins, usually forming a continuous edge between the spines, and by a bright yellow to red perianth. *A. harlana* is distinguished from *A. monticola* by its smaller bracts (9.5–15 mm long) in comparison to the larger bracts (20–22 mm long) in the latter.



Fig. 35. *Aloe harlana*, from near Harla, Harerge floristic region.

Description Mostly stemless but eventually developing a stem up to 30 cm long. Leaves numerous, 40–50 × 8–12 cm, glossy dark-green, sometimes spotted when young, with a horny layer along the margin which usually is contiguous between the spines. Marginal spines 8–10 per 10 cm, 4–5 mm long, dark-brown. Inflorescence with 3–8 racemes. Racemes subcapitate to cylindrical, 4–9(–20) cm, densely flowered. Bracts ovate, 9.5–15 × 3–6.5 mm, acuminate. Pedicels 11.5–18(–28 in fruit) mm. Perianth cylindrical-trigonous, 22–28 mm long, 4.5–7 mm wide when pressed, bright yellow or red; outer lobes free for 10–15 mm. Capsule 20–25 × 6–9 mm.

Habitat and distribution The species grows on sparsely vegetated slopes, often on limestone, between 1650 and 2100 m in Harerge floristic region. It is so far not known anywhere else. The main flowering period is in the rainy season from April to May, sometimes also from September to October.



Aloe monticola

20. *Aloe monticola* Reynolds

The specific epithet '*monticola*' refers to the habitat of the species: mountain (*monti*-) dweller (*-cola*). The species was described in 1957 from type material collected near Maychew in Tigray floristic region.

A. monticola and the previous species, *A. harlana*, belong to a group of aloes (numbers 19 & 20) which have a brownish cartilagenous tissue along the leaf margins, usually forming a continuous edge between the spines, and a bright yellow to red perianth. *A. monticola* is distinguished from *A. harlana* by the larger bracts (20–22



Fig. 36. *Aloe monticola*, from near Dessie, Welo floristic region.

mm long) in comparison to smaller bracts (9.5–15 mm long) in the latter.

Description

Stemless, usually solitary. Leaves many, 43–52(–60) × 12–13.5(–18.5) cm, gently recurved, slightly canaliculate, glossy olive-green, with a horny layer along the margin which usually is contiguous between the spines. Marginal spines 9–16 per 10 cm, 3–5 mm long, brown. Inflorescence with 3–6(–8) racemes. Racemes subcapitate to conical, 6–18 cm long, densely flowered. Bracts lanceolate, 20–30 × 6–7 cm, acute. Pedicels 12–18(–20+ in fruit) mm long. Perianth cylindrical-trigonal, 26–32 mm long, 6–7 mm wide when pressed, usually yellow, occasionally bright red; outer lobes free for 12–14 mm.

Habitat and distribution

The species grows on steep bare mountain slopes between 2400 and 2460 m in Tigray and Welo floristic regions in northern Ethiopia. It is so far not known anywhere else. The main flowering period is in the dry season, from February to April.



Aloe percrassa

21. *Aloe percrassa* Todaro

The specific epithet '*percrassa*' refers to the very (*per-*) thick (*-crassus*) nature of the leaves and stems. The species was described in 1875 based on a plant grown in St. Petersburg (Leningrad) from seeds sent by Schimper from Tigray floristic region in Ethiopia. The taxon has also been known as *A. abyssinica* var. *percrassa* Baker.

A. percrassa is in a group of aloes (*A. debrana*, *A. percrassa*, *A. rivae* and *A. trigonantha*, numbers 21–22 and 26–27) which is stemless (but some old plants developing thick, prostrate stems), and which often has secondarily branching inflorescences, with up to more than 50 racemes. *A. percrassa* is distinguished from the rest of the group by the large bracts, which are 10–16(–20) mm long.

Description

Succulent herb, suckering from base to form small groups, commonly stemless but sometimes developing erect or decumbent stem up to 80 cm long, 10–15 cm thick. Leaves crowded, 40–55 × 13–15 cm or larger, glaucous-green or grey-green, often suffused red, old leaves brown when drying. Marginal spines 6–16 per 10 cm, (2–)3–5 mm long, with pale pink to brown tips. Inflorescence 60–80 cm high with 5–12 racemes. Racemes cylindrical to conical, 6.5–25 cm long, with 2–5 flowers per cm. Bracts ovate acuminate, (8–)10–16(–20) × (2.5–)3–6 mm. Pedicels 11–17(–20) mm long. Perianth cylindrical, 17–23 mm long, 4–6 mm wide pressed; outer lobes free for 5–7 mm.

Fig. 37. *Aloe percassa*, between Edago Hamus and Gundo Gundo, Tigray floristic region.



Habitat and distribution

The species grows in sparsely vegetated rocky slopes and outcrops between 2100 and 2700 m in Tigray and Gonder regions in Rthiopia and also in Eritrea. It is so far not known anywhere else. The main flowering period is from September to October, sometimes also in March to April.



Aloe debrana

22. *Aloe debrana* Christian

The specific epithet '*debrana*' refers to the locality (*Debre Berhan* in the Shewa Region) of the plant on which the description of the species was based. In Amharic language *Debre Berhan* refers to the 'place of the light', *debre* meaning place and *berhan* meaning light. The living plant was collected by McLoughlin, cultivated in Pretoria, and the species was described in 1947.



Fig. 38. *Aloe debrana*, from top of Blue Nile Gorge, Shewa floristic region.

A. debrana belongs to a group of aloes (numbers 21–22 and 26–27) which often exhibit secondary branching (up to 50 racemes or more) and which usually are stemless, but some old plants develop thick, prostrate stems. *A. debrana* is distinguished from the rest of the group by the small bracts 3–6.5(–8.5) mm long.

Description

Succulent herb, suckering from base to form small groups, mostly stemless but some old plants develop thick, prostrate stems. Leaves in a very dense rosette, spreading-recurved, 25–60 × 7.5–15 cm, dull green, old leaves brown when drying. Marginal teeth 7–10 (–14) per 10 cm, 2–4 mm long, with red tips. Inflorescence ca. 100 cm long, compoundly branched; racemes 8–50. Racemes capitate to cylindrical, 5–15 cm long, lax or dense (4–9 flowers per cm). Bracts ovate-triangular, 3–6.5(–8.5) × 1.5–3 mm, scarious. Pedicels 10–15(–17 in fruit) mm long. Perianth cylindrical, 17–30 × 4–6 mm when pressed; outer lobes free for 5–10 mm.

Habitat and distribution

The species commonly grows in areas of grassland on thin soil overlying basalt, usually on gentle slopes between 2000 and 2700 m in Shewa, Gojam and Welo floristic regions. It is so far not known anywhere else. The main flowering period is in the dry season, from December to February.

Notes

There are two forms of the species. The first form has relatively small perianths (18–22 mm long) and bracts (3–5 mm long), while the second has larger perianths

(24–30 mm long) and bracts (4–6.5 mm long). The second form was described as *A. berhana* by Reynolds in 1957 from Debre Berhan area in Shewa Region. The presence of these two forms almost side by side in some sites and the continuous variation in these traits give reason to treat these plants as one variable species.



Aloe steudneri

23. *Aloe steudneri* Schweinfurth

The specific epithet '*steudneri*' is given in honour of Dr. Steudner, who collected the plant material on which the description of the species was based. It was described by Schweinfurth in 1894 based on type material collected from the Semien Mountains in Gonder region in northwestern Ethiopia.

A. steudneri is in a group of aloes (*A. ankoberensis*, *A. pulcherrima* and *A. steudneri*, numbers 23–25) which usually have pendent or prostrate stems, a U-shaped peduncle and a long perianth (30–40 mm). They grow on cliffs in high altitude mountain areas. The outer lobes of the perianth of *A. steudneri* are free almost to the base, a character which separates it from the other species of the group. This feature is almost unique among the aloes occurring in the region.



Fig. 39. *Aloe steudneri*, from the Semien Mountains, Gonder floristic region.

Description Stemless or with short decumbent stem. Leaves very numerous, up to $50\text{--}60 \times 10\text{--}15$ cm, slightly recurved, blue or grey-green sometimes suffused with red, not spotted. Marginal teeth 4–12 per 10 cm, 1.5–3(–4) mm long, reddish. Inflorescence few-branched, 1–5 racemes. Racemes cylindrical, 11–35 cm long, dense. Bracts ovate-lanceolate, $11\text{--}15(28) \times 6\text{--}8$ mm. Pedicels 8–15(–17 in fruit) mm long. Perianth cylindrical, $(30\text{--})35\text{--}40$ mm long, 6–9 mm wide when pressed, pale to orange-red; outer lobes $\pm$ free to base.

Habitat and distribution The species grows on very steep slopes and cliff faces, sometimes where these are wet seasonally; between 2600 and 3150 m in Tigray, Gonder and Gojam floristic regions in Ethiopia and in Eritrea. It is so far not known anywhere else. The main flowering period is from August to October.



Aloe ankoberensis

24. *Aloe ankoberensis* Gilbert & Sebsebe

The specific epithet '*ankoberensis*', refers to the place, *Ankober* in Shewa region where the type collection was made by Mrs Jonquil Ash. The species was described in 1997.

A. ankoberensis belongs to a group of aloes (numbers 23–25) which usually have pendent or prostrate stems, a U-shaped peduncle and a long perianth (30–40 mm). They grow on cliffs in high altitude mountainous areas. *A. ankoberensis* is distinguished from *A. steudneri* by the outer lobes of the perianth being free only in the upper half (instead of almost to the base). In addition, *A.*

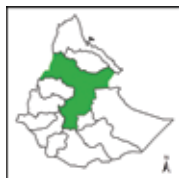


Fig. 40. *Aloe ankoberensis*, from Debre Sina, Shewa floristic region.

ankoberensis differs from *A. pulcherrima* by the leaves having 2–3 mm long marginal spines, while marginal teeth are almost absent in *A. pulcherrima*.

Description Pendent shrub, mostly unbranched, stem up to 6 m long, hanging down cliffs. Leaves numerous, dense, 20–30 × 7–17.5 cm, dull greyish to bluish-green. Marginal spines 7–9 per 10 cm, 2–3 mm long, pale, often with minute dark reddish brown tips. Inflorescence with 1–6 racemes; peduncle ± U-shaped. Racemes cylindrical, 6–18 cm long, dense. Bracts ovate-lanceolate, 14–23(–25) × 5–6.5 mm, with acute tips. Pedicels (6–)10–25(–30 in fruit) mm. Perianth cylindrical, 35–40 mm long, 6–10 mm wide when pressed, bright orange red; outer lobes free for 12–22 mm. Capsule 28–30 mm long. Seeds ± 3 sided with winged margins ca. 0.5 mm wide, 4 mm long overall, dark brown with pale round spots.

Habitat and distribution The species grows on steep rocky slopes and cliff faces, often near seasonally running water between 3000 and 3500 m in Shewa floristic region. It is so far not known anywhere else. The main flowering period is from October to February.



Aloe pulcherrima

25. *Aloe pulcherrima* Gilbert & Sebsebe

The specific epithet '*pulcherrima*', refers to the beauty (*pulcher*) of the plant, with bright red flowers and the non-spiny pale blue-green to glaucous leaves. The species was described in 1997, based on type material collected near Addis Ababa.

A. pulcherrima belongs to a group of aloes (numbers 23–25) which usually have pendent or prostrate stems, a U-shaped peduncle and a long perianth (30–40) long. They grow on cliffs in mountainous areas at high altitudes. *A. pulcherrima* is recognised by the pale blue-

Fig. 41. *Aloe pulcherrima*, from Debre Libanos, Shewa floristic region (the plants in the background are *A. debrana*).



green leaves with fine distinct longitudinal lines and by almost lacking marginal teeth.

Description

Prostrate or pendent shrub, mostly unbranched, stem up to 1 m long, ca. 8 cm thick, sometimes branching dichotomously within leaf rosette, especially when cultivated. Leaves 35–50 in dense rosette, arcuate, up to 50×12 cm, pale blue green, slightly glaucous (turning purple when old), with fine but distinct longitudinal lines and, especially in the dry season, with red margins, leaf sap becomes purple when exposed to air. Marginal teeth almost obsolete, up to 3 per 10 cm, 0.2–0.3 mm long, hardly visible. Inflorescence at first descending, then ascending so it becomes $\pm$ U-shaped, branched with 3–6(–11) erect racemes. Racemes 12–28 cm long, lax (3–5 flowers per cm). Bracts ovate, $8-9(-15) \times 7-8$ mm, acuminate, rather fleshy. Pedicels 8–12 mm long. Perianth cylindrical, 32–33 mm long, 6–8.5 mm wide when pressed, red; outer lobes free for c. 20 mm.

Habitat and distribution

The species grows on steep basalt slopes or cliffs with sparse cover of evergreen bushland between 2500 and 2750 m in Gonder, Gojam, Welo, and Shewa floristic regions. It is so far not known anywhere else. It occurs in a very sporadic manner, mainly on cliffs, and almost always in inaccessible places. The main flowering period is from July to September.



Aloe trigonantha

26. *Aloe trigonantha* Leach

The specific epithet '*trigonantha*' refers to the three-angled (*trigonus*) flower (*anthos*). The species was described in 1971 from a plant collected by *Maclean* in an area between Bahir Dar and Gonder in Gonder floristic region and cultivated in Pretoria.

A. trigonantha belongs to a group of aloes (numbers 21–22 and 26–27) which often has secondary branching (up to 50 racemes or more) and which is usually stemless, but some old plants may develop thick, prostrate stems. *A. trigonantha* is distinguished from the rest of the group by the three angled perianth with a truncate base.

Description

Rosettes stemless or nearly so. Leaves in a dense rosette, 25–40 $\times$ 5–8 cm, uniformly green. Marginal spines 9–10 per 10 cm, 2–2.5 mm high, brown tipped. Inflorescence with 5–50 racemes. Racemes 8–24 cm long, lax (2–4 flowers per cm). Bracts ovate, $6-8 \times 3-4$ mm, acuminate. Pedicel 5–10 mm long. Perianth markedly trigonous with truncate base, 28–33 mm long, 8–11 mm wide near base when pressed, 7–8 mm wide near mouth, pale yellow to orange red; outer lobes free for 6–9 mm.

Fig. 42. *Aloe trigonantha*, from south of Bahir Dar, Gojam floristic region.



Habitat and distribution

The species grows on dry stony ground near roads and along field margins between 1900 and 2100 m in Gonder and Gojam regions. It is so far not known anywhere else. The main flowering period is from September to January.



Aloe rivae

27. *Aloe rivae* Baker

The specific epithet 'rivae' is given in honour of the Italian medical Doctor, Domenico Riva, who made an expedition to Southern Ethiopia in 1893 together with Count Eugenio Ruspoli from whose collection the type of the species was described in 1898. The type material was collected at Gobbo Duaya, an area between Corroma and Burji in Sidamo floristic region.

A. rivae is in a group of aloes (numbers 21–22 and 26–27) which often has secondary branching (up to 50 racemes or more) and which usually is stemless, but some old plants develop thick, prostrate stems. *A. rivae* is distinguished from the rest of the group by the particularly branched inflorescence, and also by occurring in a different geographical area. It is the only species in the group known from the southern part of Ethiopia. The other species only occurs in the central and northern Ethiopia.

Description

Rosettes usually stemless, sometimes with procumbent to ascending stem, up to 60 cm long, solitary or in small groups. Leaves ca. 20,



Fig. 43. *Aloe rivae*, from north of Mega, Sidamo floristic region.

40–60 × 9–13.5(–17) cm, ascending, incurved to slightly reflexed, dull olive to brownish green flushed red towards margins. Marginal teeth 7–14 per 10 cm, 3.5–4 mm long, with minute brown tips. Inflorescence 60–70 cm high, conical with many branches, having 50 racemes or more. Racemes (10–)15–20 cm long, cylindrical, lax (3 flowers per cm). Bracts ovate (2–)3–4.5 × (2–)3–3.5 mm. Pedicels 7–12 mm long. Perianth cylindrical-trigonous with truncate base, 24–32 mm long, 9.5–10.5 mm wide near base when pressed, scarlet, rarely yellow; outer lobes free for 6–10 mm. Capsule 18–20 mm long.

Habitat and distribution

The species grows at the margins of deciduous woodland and *Juniperus* forest, sometimes on rocky outcrops between 1360 and 2000 m in Sidamo floristic region in southern Ethiopia. It also occurs in Northern Kenya. The main flowering period is from September to December.



Aloe secundiflora

28. *Aloe secundiflora* Engler

The specific epithet '*secundiflora*', refers to the arrangement towards the same side (*secundus*) of the flowers (*-floris*) in the inflorescence. The species was described by Engler in 1895 based on material that was collected in the Moshi District in Tanzania.

A. secundiflora is an almost unique species among the stemless aloes in Ethiopia by having the flowers arranged towards one side of the inflorescence (also seen in some



Fig. 44. *Aloe secundiflora*, from south of Yabello, Sidamo floristic region.

forms of *A. pirottae*), and by the beautifully arranged dark-brown marginal teeth on the leaves.

Description Rosettes stemless or nearly so, usually solitary. Leaves ca. 20, 35–45 × 8–14 cm, suberect with recurving tips, dark-green, slightly glossy, sometimes obscurely pale spotted. Marginal teeth 8–10 per 10 cm, 4–5 mm long, dark brown, colour sometimes continuous along margin. Inflorescence 1–1.5 m high, with many spreading branches, lower branches always branching again, with up to 50 racemes. Racemes 12–20 cm long, distinctly one-sided with flowers all ± erect, ± lax (3–4 flowers per cm). Bracts 2.5–5 × 1.5–2.5(–4) mm. Pedicels 5.5–6(–10) mm long. Perianth cylindrical, 19–23(–28) mm long, ca. 4.5 mm wide when pressed, pale red, minutely white spotted when alive.

Habitat and distribution The species grows in open grassland and *Acacia* bushland on well drained soils between 1350 and 1550 m in Gamo Gofa and Sidamo floristic regions in southern and

southwestern Ethiopia. It is also known from southern Sudan, Kenya and Tanzania. The common flowering period in Ethiopia is from April to May, sometimes also in August to December.



Aloe otallensis

29. *Aloe otallensis* Baker

The specific epithet '*otallensis*' refers to the place of growth, *Otalla* from where the type collection was made by Ruspoli and Riva. The species was described in 1898 from the type material collected in Ahele Bekaka, between Coromme and Otalla in Sidamo floristic region. It had also been known by other names: *A. boranensis* described by Cufodontis in 1939 from plants collected near Dubuluk, north of Mega in the same region. Reynolds had also applied the name *A. wrefordii* to refer to plants (from Ethiopia) that belong to this species. *A. wrefordii* in the strict sense is restricted to East Africa.

A. otallensis is unique among the Ethiopian aloes by the unusually ornamented midribs of the outer perianth lobes, a character not known in any other species; the glaucous colour of the vegetative parts of the inflorescence; and

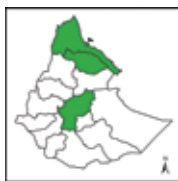


Fig. 45. *Aloe otallensis*, from Arba Minch, Gamo Gofa floristic region.

the pale-pink perianth and the large bracts (11–17 mm long). This makes the species very easy to recognise.

Description Rosettes solitary or forming small clumps, stemless. Leaves ca. 24, erect to slightly recurved, 35–80 × 6.5–10 cm, canaliculate, grey green, sometimes very finely spotted (conspicuously spotted in seedlings). Marginal teeth 8–14 per 10 cm, 3–4.5 mm long, reddish-brown. Inflorescences glaucous throughout, branched with up to 12 racemes. Racemes erect, 5–8 cm long, cylindrical, very dense, with overlapping bracts. Bracts oblanceolate, 11–17 × 4–6.5 mm, ± acute, scarious. Pedicels 7–12(–17) mm long. Perianth cylindrical to clavate, 19–23(–27) mm long, 4.5–6 mm wide when pressed, pale pink with grey or yellow tip; outer lobes free for c. 10 mm, with conspicuous warty/papillose midrib. Capsule 16 mm long, papillose. Seeds ± 3-sided, 4.5 mm long, dark-brown with long pale brown wings.

Habitat and distribution The species grows in open *Acacia* bushland, often on dark soils between 1200 and 1600 m in Gamo Gofa and Sidamo floristic regions. It is so far not known anywhere else. The main flowering period is from September to December.



Aloe elegans

30. *Aloe elegans* Todaro

The specific epithet '*elegans*' refers to the overall elegant (*elegans*) nature of the plant. This refers particularly to the attractive and conspicuous bright colours of the flowers. It is possible to see the different shades of colours (yellow, orange and scarlet) of the different populations in the same general area. Todaro described and illustrated the species in 1882, from a plant grown from seeds sent by *Schimper* from Tigray region, probably in 1870.

A. elegans is a unique species and is easily recognised by the grey to blue-green leaves that usually are incurved, the dense subcapitate to cylindrical racemes, and the bright yellow, orange or scarlet perianth.

This species is very variable with respect to the form of the racemes and the colour of the flowers. There may be a tendency that dense inflorescences often bear yellow flowers, while plants with more elongated inflorescences have red flowers. But the forms occur together and there is no justification for recognition of infraspecific taxa.

Description Succulent herb, rarely developing decumbent stem to 30 cm long, solitary or forming small groups. Leaves dense, 16–20 (–30) per rosette, up to 60 × 15–18 cm, usually incurved, grey to bluish-

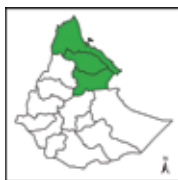


Fig. 46. *Aloe elegans*, from near Axum, Tigray floristic region.

green, sometimes obscurely spotted near base, slightly canaliculate towards tip. Marginal spines 4–7(–9) per 10 cm, 2–3(–4) mm high, brownish red. Inflorescences with 3–11 racemes, often $\pm$ corymbose. Racemes subcapitate to cylindrical, 5–15 cm long, dense (more than 10 flowers per cm). Bracts ovate, 7–12(–15) $\times$ 2.5–4 mm, acuminate. Pedicel 10–20(–23 in fruit) mm long. Young buds horizontal to slightly reflexed. Perianth subclavate, 21–26 mm long, 3–6/6–9 mm wide when pressed, yellow, orange or scarlet; outer segments free for 7–13 mm.

Habitat and distribution

The species grows in rocky slopes, mostly on sandstone or limestone, in areas of evergreen bushland or wooded grassland between 1500 and 2400 m in Tigray, Welo, Gojam and Shewa floristic regions in Ethiopia and in Eritrea. It is so far not known anywhere else, but *A. sinkatana* Reynolds, described from the Red Sea Hills of Sudan is closely related and possibly not specifically distinct. The main flowering period is from September to December, also occasionally from March to May.



Aloe camperi

31. *Aloe camperi* Schweinfurth

The specific epithet '*camperi*' is, according to Schweinfurth, given in honour of 'an esteemed friend Manfredo Camperio, who did so much for the Italian Colony of Eritrea'. The species was described in 1894

based on the type material collected near Ghinda in Eritrea. It is also known by other names, such as *A. eru* described by Berger in 1908, and as *A. abyssinica* in the sense of Salm Dyck, not in the sense of Lamarck (1783).

A. camperi belongs to a group of caulescent aloes (numbers 31–41) mainly characterised by erect, ascending or sprawling stems that are more than 5 cm in diameter. There is a clear geographical separation of the caulescent group of aloes into two subgroups. Species of the first subgroup (including *A. adigratana*, *A. camperi*, *A. schelpei*, and *A. sinana*) occur from northern Shewa towards Eritrea, while species in the second subgroup (including *A. calidophila*, *A. gilbertii*, *A. megalacantha*, and *A. yavellana*) occur from southern Shewa and extending to Eastern and Southern Ethiopia. Thus the distinctive characters will be mentioned only in relation



Fig. 47. *Aloe camperi*, cultivated material, original specimen collected from near Kombolcha, Welo floristic region.

to those species occurring within the same geographical area.

A. camperi is distinguished from the related species occurring in northern Ethiopia by the clavate perianth which is 18–22 mm long and the small bracts 2–3(–5) × 1–2 mm.

A. camperi forms a polymorphic species. With regard to pedicel length the plants observed separate into two non overlapping size classes: 12–16 mm long including the type of *A. camperi* and 22–25 mm long including the type of *A. eru*. The two forms overlap in distribution and no other characters correlate. Thus it does not seem feasible to recognise the two groups as distinct taxa.

Description

Succulent shrub, stems erect or ascending, 0.5–1 m long, 6–10 cm thick. Leaves crowded, 40–60 × 5.5–8(–12) cm, recurved, canaliculate, dark-green or brownish, often spotted (especially towards the base, margin with 6–7 spines per 10 cm, spines 3–5 mm long, with brown tips. Inflorescence branched with 2–6 racemes. Racemes cylindrical, 3–14 cm long, dense, 8–12 flowers per cm. Bracts triangular-ovate, 2–3(–5) × 1–2 mm. Pedicels 12–25 mm long. Perianth clavate, 18–22 mm long, 3–4 mm wide near base, 7–8 mm at widest point, yellow, orange or scarlet, outer segments free for 7–8 mm.

Habitat and distribution

The species grows abundantly on rocky slopes and sandy alluvial plains along the eastern escarpment; between 550 and 2700 m in Tigray and Welo floristic regions in Ethiopia and in Eritrea. It is so far not known anywhere else. The main flowering period is from March to May.



Aloe adigratana

32. *Aloe adigratana* Reynolds

The specific epithet '*adigratana*' refers to the place, *Adigrat* in the Tigray floristic region where the type collection was made by Reynolds. The species was described in 1957.

A. adigratana belongs to a group of caulescent aloes (numbers 31–41) mainly characterised by erect, ascending or sprawling stems. *A. adigratana* is distinguished from the related species occurring in central and northern Ethiopia by the subclavate perianth 25–27(–33) mm long, and the ovate-acuminate to almost triangular bracts, 8–12 × 2.5–4 mm.

Fig. 48. *Aloe adigratana*, from near Mekele, Tigray floristic region.



Description

Shrubby, stem erect to 1 m long or decumbent to 2 m long. Leaves crowded, $40\text{--}60 \times 7\text{--}15$ cm, deeply canaliculate, dull-green with numerous pale green spots on the lower third to quarter of both surfaces, margin with 4–5 spines per 10 cm. Marginal spines 3–4 mm long, reddish-brown. Inflorescence to 1 m high, branched with 3–5 racemes. Racemes cylindrical-conical, 12–22 cm long, densely flowered (c. 8 flowers per cm). Bracts ovate-acuminate to almost triangular, $8\text{--}12 \times 2.5\text{--}4$ mm. Pedicels (12–)14–20 mm long. Perianth subclavate, 25–27(–33) mm long, 6–8 mm wide, orange or yellow, outer segments free for 13–16 mm.

Habitat and distribution

The species grows in rocky places, mostly on sandstone, also on basement complex between 2000 and 2700 m in Tigray floristic region in northern Ethiopia. It is so far not known anywhere else. The main flowering period is from January to April.



Aloe sinana

33. *Aloe sinana* Reynolds

The specific epithet '*sinana*' refers to the place, *Debre Sina* in northeastern Shewa where the type collection was made by Reynolds. The species was described in 1957.

A. sinana belongs to a group of caulescent aloes (numbers 31–41) mainly characterized by erect, ascending or sprawling stems. *A. sinana* is distinguished from the related species occurring in central and northern Ethiopia by the subclavate perianth, 23–27 mm long, and the ovate bracts, $7\text{--}8 \times 2$ mm.

Description

Succulent shrub, stems 1–2 m long, sprawling or ascending. Leaves $\pm$ crowded, $40\text{--}60 \times 10\text{--}15$ cm, canaliculate only towards tip, bluish to greyish-green, sometimes flushed reddish, with elongated

Fig. 49. *Aloe sinana*, from near Debre Sina, Shewa floristic region.



whitish spots on the underside and towards base on the upperside. Marginal teeth 6–7 per 10 cm, 3–4 mm long. Inflorescence with 4–6 racemes. Racemes subcapitate to cylindrical, 5.5–8.5(–14) cm long, 6–12 flowers per cm. Bracts ovate, $7-8 \times 2$ mm, tip attenuate. Pedicels 18–25(–27 in fruit) mm long. Perianth clavate, 23–27 mm long, when pressed 3–4 mm wide near base, 6–7 mm at widest point, orange to pink; outer segments free for 12–13 mm.

Habitat and distribution

The species grows on basaltic slopes, often in areas of evergreen *Euclea-Rhus natalensis*–*Flueggea virosa* bushland between 1250 and 1950 m in Welo and Shewa floristic regions. It is so far not known anywhere else. The main flowering period is from December to April.



Aloe calidophila

34. *Aloe calidophila* Reynolds

The specific epithet '*calidophila*' refers to the hot climate where the plant grows. In short it means warm/hot (*calido*-) loving (*-philus*). The species was described in 1957 with the type material collected from the Dida Cheena Plains, between Moyale and Mega, in Sidamo floristic region.

A. calidophila belongs to a group of caulescent aloes (numbers 31–41) mainly characterized by erect, ascending or sprawling stems. *A. calidophila* is distinguished from the related species occurring in southern and eastern Ethiopia by the clavate perianth, 17–22 mm long, with outer segments free for 8–10 mm, the 10–15 mm long pedicels and the ovate bracts, $3-5 \times 1.5-2$ mm.



Fig. 50. *Aloe calidophila*, from north of Moyale, Sidamo floristic region.

Description Succulent shrub, stems 1–1.5 m, erect or basally decumbent. Leaves crowded, 60–80 × 16 cm, spreading with recurved tip, deeply canaliculate, uniformly dull-green to grey-green; margin with ca. 5 spines per 10 cm. Marginal spines 3–5 mm long, dull white. Inflorescence branched with up to 20 racemes. Racemes cylindrical, 5.5–24 cm long, dense, 6–7 flowers per cm. Bracts ovate, 3–5 × 1.5–2 mm, scarios. Pedicels 10–15 mm long, extending to 22 mm in fruit. Perianth clavate, 17–20(–22) mm long, widest part 6–7 mm when pressed, scarlet turning orange towards throat; outer segments free for 8–10 mm.

Habitat and distribution The species grows in *Acacia-Commiphora* woodland/ bushland or open wooded grassland between 1280 and 1620 m in Sidamo floristic region. It also occurs in northern Kenya. The main flowering period in Ethiopia is from September to December, but sometimes also in April to May.

35. *Aloe megalacantha* Baker

The specific epithet '*megalacantha*' refers to the larger (*megala*-) spines (*cantha*) on the leaf margins. The species was described in 1898. The type material was collected near Milmil in the Ogaden region, eastern Ethiopia.

A. megalacantha belongs to a group of caulescent aloes (numbers 31–41) mainly characterized by erect, ascending or sprawling stems. *A. megalacantha* is distinguished from the related groups occurring in southern and eastern Ethiopia by the cylindrical-trigonous perianth, 23–30 mm long, with the outer segments free for 10–14 mm, the pedicels (8–)10–15 mm long and the triangular-ovate bracts 5–12 × 2–4 mm.

Description

Succulent shrub, 0.5–2 m high. Leaves crowded, 60–80 × 13–15 cm, deeply canaliculate, recurved, dull light-green to bluish-green. Marginal spines 5–7 per 10 cm, 4–6 mm long, pinkish to reddish-brown. Inflorescence 0.5–1 m high, with 6–13 racemes. Racemes cylindrical to conical, 5–14 cm long, lax or dense. Bracts triangular to ovate, 5–2 × 2–4 mm. Pedicels (8–)10–15(–17 in fruit) mm long. Perianth cylindrical-trigonous, 23–30 mm long, 4–7 mm wide when pressed, yellow orange or scarlet; outer segments free for 10–14 mm.

Subspecies

The species is divided into two subspecies, based on differences in the length of the bracts and the marginal spines.

-
1. Bracts 4–7 mm long; marginal spines 5–6 mm long
a. subsp. *megalacantha*
 - Bracts 11–12 mm long; marginal spines ca. 4 mm long
b. subsp. *alticola*
-



Aloe megalacantha
subsp. *megalacantha*

a. subsp. *megalacantha*

The subspecies is characterised by having ascending stems thus forming a sprawling bush. Marginal spines are 5–6 mm long. The racemes are denser than in subsp. *alticola* with (6–)7–10 flowers per cm. The bracts are 5–8.5 mm long and the perianth 23–28 mm long.

The subspecies grows on rocky hillsides and sandy alluvial plains in open *Acacia-Commiphora-Balanites* bushland; frequently planted on graves between 1100 and 1850 m in Bale and Harerge floristic regions. It also occurs in northern Somalia. The main flowering period in Ethiopia is from August to October, sometimes also in April.



Fig. 51. *Aloe megalacantha* subsp. *megalacantha*, from near Asbe Teferi, Harerge floristic region.



Aloe megalacantha
subsp. *alticola*

b. subsp. *alticola* Gilbert & Sebsebe

The subspecific epithet '*alticola*', refers to its occurrence at higher altitudes. The name literally means high altitude (*alti-*) dweller (*-cola*). The subspecies was described by Gilbert and Sebsebe in 1997. The type material was collected in an area between Alemaya and Grawa in Harerge region.

The subspecies is characterised by having stems more erect, often forming compact clumps. The marginal spines are ca. 4 mm long. The racemes are laxer with only 3–5 flowers per cm. The bracts are longer, 11–12 mm, and so are the tepals (28–30 mm long).

The subspecies grows in margins of evergreen thickets on limestone slopes between 2100 and 2150 m in Harerge floristic region. It is so far not known anywhere else. The main flowering period is from August to October; sometimes also from April to May.

36. *Aloe gilbertii* Reynolds ex Sebsebe & Brandham

The specific epithet '*gilbertii*', was given in honour of one of the collectors of the type specimen, an outstanding botanist who has contributed importantly to the progress

of the knowledge of the Ethiopian Flora, M.G. Gilbert. The name was proposed by Reynolds, and the species was later formally described in 1997. The type material was collected from an area south of Awassa towards Yirgalem in Sidamo floristic region.

A. gilbertii belongs to a group of caulescent aloes (numbers 31–41) mainly characterized by erect, ascending or sprawling stems. *A. gilbertii* is distinguished from the related species occurring in southern and eastern Ethiopia by the cylindrical to subclavate perianth, 23–27 mm long, with the outer segments free for 8–11 mm, the pedicels 9–10 mm long and the triangular-ovate bracts, $4-6 \times 2-3$ mm. It also shows similarities to *A. calidophila*, which is best separated by the longer and more strongly reflexed, deeply canaliculate leaves, less branched inflorescence and smaller, more clavate flowers.

Description

A succulent shrub, stem erect, up to 1–1.5 m long, occasionally $\pm$ stemless. Leaves crowded, $40-60 \times 9-11$ cm, canaliculate, recurved towards tip, dark green or glaucous, often flushed brown or mauve above and below. Marginal teeth 7–10 per 10 cm, 3–5 mm long, with brown tips. Inflorescence up to 1.2 m high, compoundly branched with 15–25 racemes. Racemes cylindrical, 6–15 cm long, lax, 2–4(–5) flowers per cm. Bracts ovate, acute, $4-6 \times 2-3$ mm. Pedicels 9–10 mm long. Perianth cylindrical to subclavate, trigonously indented, 23–27 mm long, 4.5–8 mm wide when pressed, orange to red; outer segments free for 8–11 mm.

Subspecies

Two subspecies are recognized in the Flora area.

1. Leaves only slightly recurved, easily flattened when prepared for drying; perianth 23–27 mm long. a. subsp. *gilbertii*
- Leaves strongly recurved, impossible to flatten when prepared for drying; perianth 27–28 mm long. b. subsp. *megalacanthoides*



Aloe gilbertii subsp.
gilbertii



Aloe gilbertii subsp.
megalacanthoides

a. subsp. *gilbertii*

The subspecies grows in *Acacia* woodland, often found in hedges and along field margins; between 1300 and 1800 (1900) m in Shewa, Gamo Gofa and Sidamo floristic regions. It is recognised by the characters given in the key above. It is so far not known anywhere else. The main flowering period is from October to December.

b. subsp. *megalacanthoides* Gilbert & Sebsebe

The subspecific epithet '*megalacanthoides*' refers to *A. megalacantha* like (-oides), referring to the resemblance between this subspecies and *A. megalacantha*. The subspecies was described in 1997. The type material was



Fig. 52. *Aloe gilbertii* subsp. *gilbertii*, from near Langano, Shewa floristic region.

collected in Konso on the road to Yabello in Gamo Gofa floristic region.

The subspecies grows in open or dense *Acacia-Commiphora* bushland, on rocky places with *Adenia venenata* between 1200 and 1350 m in Gamo Gofa floristic region. It is so far not known anywhere else. The main flowering period is from October to November; sometimes also from April to May.



Aloe schelpei

37. *Aloe schelpei* Reynolds

The specific epithet '*schelpei*' is given in honour of one of the collectors, Dr. E. A. Schelpe, University of Cape Town, whose collection was designated as the type. The species was described in 1954. The type material was collected in Bole Valley north of Addis Ababa, Shewa floristic region by Curle and Schelpe.

A. schelpei belongs to a group of caulescent aloes (numbers 31-41) mainly characterised by erect, ascending or sprawling stems. *A. schelpei* is distinguished from the related species, occurring in central and northern Ethiopia, by the cylindrical perianth, 27–30 mm long,

Fig. 53. *Aloe schelpei*, from Debre Libanos, Shewa floristic region.



with the outer segments free for 12–15 mm, the (10–)12–17 mm long pedicels and the triangular-ovate bracts 6–8 × 2–4 mm.

Description

Succulent shrub, stems decumbent or pendent, 0.5–1 m long, 5–6 cm thick. Leaves crowded, 45–50 × 8–12 cm, spreading to recurved, shallowly canaliculate, glaucous-grey to blue-green with pinkish margin, sometimes spotted above and below towards base. Marginal spines 7–11 per 10 cm, 3–4 mm long, pinkish. Inflorescence with 1–3 racemes only. Racemes cylindrical to conical, 6–16 cm long, 6–8 flowers per cm. Bracts ovate, 6–8 × 2–4 mm. Pedicels 10–17(–20 in fruit) mm long. Perianth cylindrical, (22–)27–30 mm long, 5–7 mm wide when pressed, orange to orange-red; outer segments free for (8–)12–15 mm.

Habitat and distribution

The species grows in more open areas within evergreen bushland on steep slopes and cliffs of basalt between 1700 and 2470 m in Shewa floristic region. It is so far not known anywhere else. The main flowering period is from October to March.



Aloe ghibensis

38. Aloe ghibensis Sebsebe & Friis

The specific epithet '*ghibensis*' refers to the "Ghibe Gorge" in Kefa floristic region, from where the type specimen was collected from and known distribution of the species so far. The species is described in Kew Bulletin in 2010.



Fig. 54. *Aloe ghibensis*, from Ghibe Gorge, Kefa floristic region.

A. ghibensis belongs to a group of caulescent aloes (numbers 31–41 mainly characterized by erect, ascending and sprawling stems. *Aloe ghibensis* is distinguished with the related species by its habitat occurring in *Combretum-Terminalia* woodland in the western part of Ethiopia. It is distinguished from the closely related species, *A. schelpei* in central Ethiopia by the inflorescence with 7–8 racemes; flowers secund, lax with 1–2 flowers per cm length; bracts 3–4 mm long and flower pedicel 5–6 mm long. In contrast, *A. schelpei* has single or 2–3 racemes, flowers arranged in all sides, denser inflorescence and longer bracts, 6–8 mm long and pedicels 10–17 mm long.

Description Caulescent with scandent stems to 1 m long and 5–7 cm wide; rosette Leaves rosulate, 35–50 × 7–10 cm; leaf surface dull green

with smooth surface; marginal teeth 3 mm long, white with brown tips, 7–10 mm apart or 6–8 per 10 cm length; exudate drying yellow. Inflorescence 45–55 cm long, 7–8 branched; raceme cylindrical, 10–22 cm long, lax, with 1–2 flowers per cm length. Flowers subsecund on the raceme. Bracts ovate-acuminate at the apex, $3\text{--}4 \times 2.5$ mm. Pedicel 5–6 mm long (elongating to 10 mm in fruit). Perianth scarlet, (yellow-flowered according to Ash 1757) 28–30 mm long, base truncate, 6 mm across; outer tepals free for 6–8 mm long. Young capsules $17\text{--}20 \times 7$ mm.

Habitat and distribution

It grows in *Combretum-Terminalia* woodland on edge of cliffs on volcanic outcrops. Associated plants include *Combretum collinum*, *Acacia polyacantha* subsp. *campylacantha*, *Ficus sycomorus*, etc. between 1365 and 1700 m. Known so far only from the Ghibe Gorge in Kefa floristic region. The main flowering period is in November and between March and April.



Aloe clarkei

39. *Aloe clarkei* L. Newton

The specific epithet '*clarkei*' refers to the collector of the type specimen, Paul Clarke. It was described from the Naita Mtn in northern tip of the Elimi triangle, an area bordering SE Sudan in Kefa floristic region by Len Newton in 2002.

It is a unique plant among the caulescent aloes (numbers 31–41) in being a dwarf plant c. 30 cm long with marginal teeth on the leaves hooked and pointing to leaf apex and is restricted to SW Kefa bordering the Elimi triangle.

Description

Dwarf caulescent plant with stems to c. 30 cm long, erect initially, but freely branching at base to form clumps. Leaves laxly rosulate, 1–1.5 cm apart, lanceolate, up to 18×3 cm, green with a light waxy bloom and scattered elongated whitish spots occasionally with irregular transverse bands, more seen below; marginal teeth hooked pointing towards the leaf apex, 3 mm long, green with white tip, 6–9 mm apart. Inflorescence solitary, branched to 50 cm long, with 2–6 racemes. Racemes cylindrical; terminal ones 10×6 cm and lateral ones smaller; bracts ovate-attenuate, scarious, 6×3 mm with one reddish brown veins extending into the acuminate apex; pedicels to 15 mm long; perianth 25–26 mm long cylindrical above the ovary, trigonous above; outer tepals free for 10–12 mm long; stamens with pale yellow filaments, anthers exerted. Fruit $13\text{--}15 \times 5$ mm.

Habitat and distribution

The species grows in light shade in openings in montane forest at about 1980 m. Known so far only from Naita Mtn

in northern tip of the Elimi triangle, an area bordering SE Sudan in Kefa floristic region. The main flowering period is unknown.



Aloe yavellana

41. *Aloe yavellana* Reynolds

The specific epithet '*yavellana*', refers to the place of growth, *Yavello* (*Yabello*) in Sidamo floristic region from where the type collection was made by Reynolds. The species was described in 1954.

The species belongs to a group of caulescent aloes (numbers 31–41) mainly characterised by erect, ascending or sprawling stems. *A. yavellana* is distinguished from the related species occurring in southern and eastern Ethiopia by the cylindrical-trigonous perianth, 20–22 mm long, with the outer segments free for 8–10 mm, the pedicels, 8–10 mm long pedicels and the triangular-ovate bracts, $3-6 \times 1-2$ mm.

Description

Succulent shrub, stems erect to 1 m high or sprawling, up to 3 m long, 3–4 cm diameter. Leaves $\pm$ spaced along stem, $30-40 \times 5-7$ cm, recurving towards tip, slightly canaliculate, brown above, pale below and when growing in shade. Marginal spines (10–)14–17 per 10 cm, ca. 3 mm high, with reddish tips. Inflorescence with 8–10 racemes. Racemes capitate to cylindrical, 4–10 cm long, dense, 6–10 flowers per cm. Bracts triangular-ovate, $3-6 \times 1-2$ mm, scarious. Pedicels 8–10 (12–in fruit) cm long. Perianth cylindrical-trigonous, 20–22 mm long, 4–6 mm wide pressed, dull-scarlet to orange; outer segments free for 8–10 mm.

Habitat and distribution

The species grows in rocky slopes in clearings in *Juniperus* forest, and also in more disturbed areas near roads



Fig. 55. *Aloe yavellana*, from Yabello, Sidamo floristic region.

between 1600 and 1900 m in Sidamo floristic region. It is so far not known anywhere else. The main flowering period is from September to October.



Aloe friisii

40. *Aloe friisii* Sebsebe & Gilbert

The specific epithet '*friisii*' is given in honour of the eminent Danish botanist who was one of the collectors of the type specimen, and who has collected more plant specimens from Ethiopia than any other botanist so far, Prof. Ib Friis from Copenhagen University, Denmark. The species was described in 2000. The type material was collected near the Kaske River in Gamo Gofa region.

The species belongs to a group of caulescent aloes (numbers 31–41) mainly characterised by erect, ascending or sprawling stems. *A. friisii* is easily recognised from



Fig. 56. *Aloe friisii*, from Kaske River, Gamo Gofa floristic region. Plate obtained from Kew Bulletin.

other members of the group by its paniculate inflorescence with yellow flowers.

Description Erect or sprawling shrublet, unbranched or forming small clumps of up to 3 stems; stems to 20 cm long, 2–4 cm thick. Leaves narrowly elliptic, 25–35 × 3.5–5 cm, pale green with sparse white spots, these sometimes rather obscure. Marginal teeth 2–8 mm apart, 1–2 mm long, whitish, sometimes with brownish tips. Inflorescence ascending, 50–75 cm long, with 8–13 branches, lower most with short secondary branches. Racemes 3–14 cm long with two to three flower per cm. Bracts ovate, 2–5 × 1–3 mm, scarious. Pedicels 8–12 mm long. Perianth cylindrical, 22–25 × 7–10 mm wide when pressed; outer lobes free for 1/3 of their length.

Habitat and distribution The species grows on rocky slopes in *Acacia horrida* bushland and under *Euclea schimperi* and *Acacia hockii* thickets in *Acacia–Combretum–Terminalia* woodland between 600 and 1600 m in Gamo Gofa floristic region. It is so far not known anywhere else. The main flowering period is from January to February.



Aloe welmelensis

42. *Aloe welmelensis* Sebsebe & Nordal

The specific epithet '*welmelensis*' refers to the Welmel River in Bale floristic region, along which the type material of the species was collected from and the known distributeion of the species so far. The species is described in Kew Bulletin in 2010.



Fig. 57. *Aloe welmelensis*, from Welmel River, Bale floristic region.

The species belongs to a small group of caulescent aloes (numbers 42–45) that occur in Eastern and Southeastern Ethiopia characterised by narrow, distinctly or obscurely spotted leaves which are separated along the erect or sprawling stems, stems 1–2 cm in diameter. It is distinguished from the closely related species *A. tewoldei* by the marginal spines being white, obsolete to 1 mm long, flowers arranged to one side i.e. secund, perianth 30–32 mm long and pedicel 5–7 mm long. In contrast, *A. tewoldei* has pinkish marginal spines that are c. 2 mm long, flowers arranged in all sides, perianth 20 mm long and pedicels 12 mm long.

Description

Caulescent, suckering to form groups. Stem erect to decumbent 30–60 cm long, 1.8–2 cm wide. Roots hairy. Leaves scattered along the stem 10–18, lax, arranged in 2–5 turns along the stem, grayish green, not spotted, 30–50 × 2–4 cm, surface smooth; marginal teeth obsolete, to 1 mm long, white, reddish-tipped, 3–5 mm apart or 15–17 per 10 cm length; exudate drying yellow. Inflorescence solitary or two, 50–80 cm long, with solitary or 2, rarely 4–6 racemes; raceme cylindrical, 15–30 cm long, lax, with 1–2 flowers/cm. Stamens exerted 1–4 mm long. Flowers secund. Bracts white, ovate-acuminate, 4–5 × 2.5 mm. Pedicel 6–7 mm. Perianth bright scarlet, paler to almost white towards mouth, 28–32 mm, base slightly swollen, truncate, 6–7 mm across; outer perianth parts free for 10–12 mm long. Young fruits 17–20 mm long.

Habitat and distribution

The species grows in vertical rock faces and edges of rocky valleys and on outcrops along rivers between 1050 and 1500 m. Known so far only along the Welmel River in Bale floristic region, Ethiopia. The main flowering period is in December.



Aloe tewoldei

43. *Aloe tewoldei* Gilbert & Sebsebe

The specific epithet '*tewoldei*' honours the eminent Ethiopian ecologist and the first Leader of the Ethiopian Flora Project, Dr. Tewolde Berhan Gebere Egziabher who collected the material from which the species was described in 1997. The type material was collected from south of Asbe Teferi in Harerge floristic region and cultivated at the Royal Botanic Gardens, Kew.

The species belongs to a small group of caulescent aloes (numbers 42–45) that occur in Eastern and Southeastern Ethiopia characterised by narrow, distinctly

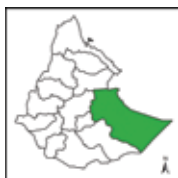


Fig. 58. *Aloe tewoldei*, from Sof Omar caves, Bale floristic region.

or obscurely spotted leaves which are separated along the erect or sprawling stems, stems 1–2 cm in diameter. It is distinguished from the closely related species *A. welmelensis* by the marginal spines being pinkish, 2 mm long, flowers arranged in all sides, perianth 20 mm long and pedicel 12 mm long. In contrast, *A. welmesnis* has marginal spines white, obsolete to 1 mm long, flowers arranged to one side i.e. secund, perianth 30–32 mm long and pedicel 5–7 mm long.

Description Lax shrublet, sometimes $\pm$ pendent; stems to 50 cm long ca. 6 mm thick. Leaves spaced along the stem, oblong-lanceolate, up to $13.5(-32) \times 1.5-2(-2.2)$ cm, subterete, grey-green, obscurely spotted. Marginal teeth 20–30 per 10 cm, c. 0.5 mm long, white. Inflorescence unbranched. Raceme very lax, ca. 27 cm long; flowers 10–40 mm apart. Bracts ca. 4×2 mm. Pedicel c. 12 mm long. Perianth trigonous-cylindrical, 20 mm long, 7 mm wide when pressed, base truncate, greyish orange with greenish tip.

Habitat and distribution The species grows hanging from limestone cliff-faces, in Harege and possibly also in Bale floristic regions. A second specimen of this species has never been collected since the first collection in the 1970's, from which the species was described. There is an urgent need to find the species in the wild and collect more material of the species. The species flowered in cultivation in October.

*Aloe elkerriana*

44. *Aloe elkerriana* Dioli & McCoy

The specific epithet '*elkerriana*' refers to the type locality El Kerre in Ogaden in Bale floristic region where the type collection was made. The species was described in 2007.

The species belongs to a small group of caulescent aloes (numbers 42–45) that occur in Eastern and Southeastern Ethiopia and. The group is characterised by narrow, distinctly or obscurely spotted leaves which are separated along the erect or sprawling stems, and by the lax inflorescences. It is distinguished from the related species by the long mainly single stems 3–5 meters long.

Description

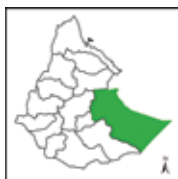
Dwarf to medium-sized plants occurring solitary or in small groups; stems single or rarely branched, 10–20 mm thick, up to 3–5 meters long. Leaves spotted below in juvenile stages, green to bluish-green, separated along the stem, triangular lanceolate up to 30×4.5 cm. Marginal spines 1–2 mm long, whitish-pink, and c. 4 mm apart. Inflorescence 1–2, branched 50–60 cm long, with 4–5 racemes. Racemes cylindrical, 10–15 cm long, sub-laxly flowered. Bracts c. 5 mm long. Pedicels 10–17 mm long. Perianth cylindric trigonous, c. 25 mm long and 5 mm wide, slightly constricted above the ovary; outer segments free to nearly half way, apices recurved, dark coral red with yellow mouth; outer segments free to nearly half way, apices recurved, stamens and stigmas exerted. Capsule dark brown, ovoid $15\text{--}19 \times 10\text{--}14$ mm.



Fig. 59. *Aloe elkerriana*, from Elkerre, Bale floristic region.

Habitat and distribution

The species grows on a bare rock cliff-face overlooking the village of El Kerre at about 1000 m in Harege floristic region. It is so far not known elsewhere. The main flowering period is unknown as it was not indicated in the protologue.



Aloe jacksonii

45. *Aloe jacksonii* Reynolds

The specific epithet '*jacksonii*' is given in honour of the entomologist and collector of the type specimen, T. H. E. Jackson. The species was described in 1955 based on the material collected near El Kerre in Bale floristic region and cultivated in Johannesburg.

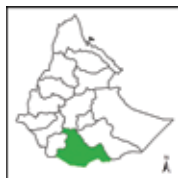
The species belongs to a small group of caulescent aloes (numbers 42–45) that occur in Eastern and Southeastern Ethiopia and. The group is characterised by narrow, distinctly or obscurely spotted leaves which are separated along the erect or sprawling stems, and by the lax inflorescences. *A. jacksonii* is distinguished from the group by heavily spotted leaves and unbranched simple inflorescence.

Description

Dwarf succulent shrub, stems erect or sprawling, 10–20 cm long. Leaves separated along stem, linear lanceolate, 11–15 × 1.2–2.2 cm, upper surface almost flat, dull-green, with pale spots above and below. Marginal teeth 16–20 per 10 cm, c. 1 mm long, pale pinkish. Inflorescence not branched, ca. 30 cm long. Raceme lax, 9–11 cm long, 3–4 flowers per cm. Bracts ovate, 4.5–5 × 2–2.5 mm. Pedicel 7–8 mm long. Perianth cylindrical, c. 2–3 mm long, 7–8 mm wide when pressed, scarlet; outer segments free for 5–6 mm.

Habitat and distribution

It grows along the edge of a narrow limestone ravine, area generally dominated by *Acacia-Commiphora* bushland at about 1050 m in Bale region. It is so far not known anywhere else. Flowering specimens seen, in cultivation, from September to October; also in June.



Aloe vituensis

46. *Aloe vituensis* Baker

The specific epithet '*vituensis*' refers to the place of growth (*Witu/Vitu*), on the Tana River in Kenya where the type collection was made by Thomas. The species was described in 1898.

The species is easily recognised by the combination of

a low shrubby habit, stems to ca. 20 cm long, and dark-green spotted leaves and the simple inflorescence.

Description Low succulent shrub, stems erect, up to 20 cm high, slender. Leaves lax, spreading with recurving tips, slightly canaliculate, 21–32 × 2.5–5 cm, light-green to bronze, clearly spotted above and below. Marginal spines 9–12 per 10 cm, 3–4 mm long, brown-tipped. Inflorescence unbranched, to ca. 75 cm long. Raceme cylindrical, 9–12 cm long, lax (ca. 3 flowers per cm). Bracts ovate-acute, 6.5–7 × 4 mm. Pedicel 4–7(–12 in fruit) mm long. Perianth cylindrical to subclavate, 21–25 mm long, 4–6(–7) mm wide when pressed, coral pink; outer segments free for c. 7 mm.

Habitat and distribution The species grows in *Acacia-Commiphora* bushland at around 1200 m in northern Kenya. The species is so far known only from the Kenyan side of the border with Ethiopia. However, the fact that it is collected close to the border at Moyale makes it probable that it may occur in Sidamo floristic region of Ethiopia, and therefore it is included here. The flowering period is from March to April.

ASPHODELACEAE

This family is sometimes defined to include Aloaceae. In the restricted sense it includes herbaceous plants where the underground organ is a rhizome, which, when cut, is yellowish inside. The leaves are arranged in a basal rosette. The peduncle (scape) is leafless. The inflorescence is unbranched, each flower subtended by a single bract. The pedicels are generally without a joint (except in *Asphodelus*). The flowers are regular with fused (in *Kniphofia*) or free (in all other genera) tepals, which may be white, greenish, yellow, pink or red. The stamens have filiform filaments, which are glabrous to scabrous (in *Kniphofia* and *Trachyandra*) or hairy (in *Bulbine* and *Jodrellia*), free or partly fused with the perianth. The anthers release the pollen inwards (introrse dehiscence). The carpels are united to form a 3-locular ovary with 2 to several ovules per cell, fixed on a central column (axile placentation). There are septal glands in the ovary. The style is slender with a small stigma. The fruit is generally a loculicidal capsule, rarely (in *Jodrellia*) without opening mechanisms. An extra cell layer (aril), covering the black seed coat, makes the seeds dull and sometimes glutinose, brownish to greyish. This aril may sometimes generate a wing-like structure around the seeds.

Distribution and classification

Asphodelaceae is an Old World tropical to temperate family with 15 genera and about 750 species, distributed in arid and mesic regions of the temperate, subtropical and tropical zones of the Old World, with the main centre of diversity in southern Africa. It is represented by 4 genera and 11 species in Ethiopia. The genus *Kniphofia* has flowers very similar to those of *Aloe*, the genera only differ in their leaf morphology and anatomy. Representatives of Asphodelaceae may sometimes be difficult to distinguish from Anthericaceae on morphology alone (especially the genus *Trachyandra*, which up to the 1960s even was included in the genus *Anthericum*). The internally yellowish rhizomes (due to the content of anthraquinones) and brownish to greyish seeds are

characters that unequivocally distinguish Asphodelaceae from Anthericaceae. The two families also differ in the way pollen grains are produced (the cell walls are produced simultaneously after the 4 nuclei in meiosis are formed in Asphodelaceae, while in Anthericaceae the cell walls are produced successively after each cell nuclear division).

Reproduction The flower morphology is very variable within the family, from the mainly bird pollinated tubular reddish or yellowish flowers of *Kniphofia* to the unspecialised open whitish flowers of *Trachyandra*, probably pollinated by flies and bees. The nectar is produced in the separating walls of the ovary (septal glands) and excreted in the bottom of the flower. The nectar production is more pronounced in the bird-pollinated *Kniphofia* than in the insect-pollinated genera, in which the pollen itself might represent the reward. The densely hairy stamens of *Bulbine* and *Jodrellia* may play a role in pollination, but this feature needs further investigation.

Most species have stiffly erect scapes and capsules that open by splits from the top, leading to ballistic seed dispersal, as in *Kniphofia*. The winged seeds imply that wind plays an important role in dispersal. In *Trachyandra* we find lax inflorescences, releasing the seeds on the ground.

Chemistry and use The genus *Kniphofia*, and to some extent also *Bulbine*, include several ornamental plants with economic potential. Inflorescences of *Kniphofia* are sold as cut flowers, although mostly of South African species.

Anthraquinones (many of which are as yet unidentified) are characteristic for the family, giving yellowish colours to the rhizomes, and in some cases also to the flowers.

Conservation Five out of the seven *Kniphofia* species are endemic to Ethiopia and Eritrea: *K. foliosa*, *K. isoetifolia*, *K. schimperii*, *K. hildebrandtii* and *K. insignis*. The three first ones are widespread and probably not threatened, whereas the two last ones, and particularly *K. hildebrandtii*, have restricted distribution, and care should be taken. *Jodrellia macrocarpa* is a near-endemic (reaching Somalia in the east), known only from a few localities, and it might be threatened.

Key to genera

The genus *Asphodelus* is included in the key, but not in the text, as its occurrence within the area is doubtful, although it has been reported from Eritrea.

- | | | |
|--|----------------|---|
| 1. Tepals fused for most of their length, thus forming tubular to funnel-shaped flowers | 1. Kniphofia. | 2 |
| - Tepals free to the base, forming more or less star-shaped flowers | | 2 |
| 2. Tepals pinkish or yellow; filaments with long hairs | | 3 |
| - Tepals white often with a reddish streak outside on the tepals; filaments glabrous or scabrid, never hairy | | 4 |
| 3. Tepals yellow, all 1-nerved | 2. Bulbine | |
| - Tepals pinkish, the outer 3-5-nerved | 3. Jodrellia | |
| 4. Pedicel without a joint, filaments scabrid without expanded base | 4. Trachyandra | |
| - Pedicels with a joint, filaments completely glabrous with expanded bases clasping the ovary | Asphodelus | |
-

1. KNIPHOFIA Moench

Plants growing from a thick rhizome in aggregates or solitarily, rarely with a thick, well developed woody stem. The leaves are arranged in basal rosettes, usually in 4 or 5 ranks, linear, tapering gradually to the apex. The scape is stout, naked except for occasional sterile bracts below the inflorescence. The inflorescence is simple, often subcapitate. The flowers are sessile or with a short pedicel. The flowers are usually pendulous, with varied colours: white, yellow, brownish or various shades of red, the red pigment is often more conspicuous at the apex, thus giving a bicoloured appearance. The perianth tube is bell-shaped to cylindrical, or somewhat funnel-shaped. The stamens are 6, usually as long as, or longer than, the perianth at anthesis. The fruit is a globose to ovoid loculicidal capsule. The seeds are somewhat flattened, acutely three- angled or -winged.

The genus includes about 70 species distributed essentially in eastern and southern Africa (with 45 species), with one species in Madagascar and one in Arabia, and 7 species are known to occur in Ethiopia.

Members of the genus produce the most beautiful and varied flowers ranging from white to pink, yellow to red. The plants within the genus do not only display these varied colours, they also display two different patterns of flower opening. In *K. isoetifolia* and *K. pumila*, the flowers open from top downwards (centrifugal), while in the other species the flowers open from base upwards (centripetal).

Key to the species

1. Raceme very dense, stamens exerted for 8-15 mm long 2
 - Raceme lax or subdense, stamens exerted for less than 4 mm long at anthesis and later withdrawn 3
 2. Perianth campanulate, 10-14(-18) mm long; flowers opening from top downwards (centrifugal) 1. *K. pumila*
 - Perianth funnel-shaped to tubular, 18-27 mm long; flowers opening from base upwards (centripetal) 2. *K. foliosa*
 3. Flowers white, pink, yellow, orange or red; bracts white or greenish, reflexed at or after anthesis 4
 - Flowers pale greenish or yellowish-white; bracts brown, not reflexed at or after anthesis 3. *K. hildebrandtii*
 4. Inflorescence cylindrical, flowers opening from base upwards (centripetal) 5
 - Inflorescence capitate, flowers opening from top downwards (centrifugal) 4. *K. isoetifolia*
 5. Perianth yellow, orange or red; roots slender, not fusiform; usually growing in well drained soil 6
 - Perianth white, buds pale pink; roots fusiform; growing in water-logged meadows 5. *K. insignis*
 6. Inflorescence lax, with 1-3 flowers per cm, $\pm$ secund; bracts narrow, 1.2-2 mm in diameter 6. *K. schimperii*
 - Inflorescence subdense, with 5-10 flowers per cm, not secund; bracts wide, 3-4 mm in diameter 7. *K. thomsonii*
-

*Kniphofia pumila*

1. *Kniphofia pumila* (Aiton) Kunth

The specific epithet '*pumila*', meaning small, is not easily to relate to a robust plant like this. The species was described by Aiton in 1789 as *Aletris pumila*, and later transferred to *Kniphofia* by Kunth in 1843. It was also known by the name *Kniphofia comosa* described by Hochstetter in 1844 from plants collected in Jan Meda (Dchara Meda) in Gonder floristic region by Schimper.

The species is related to the common *K. foliosa*, but is easily distinguished by the bell-shaped perianth, 10–14(–18) mm long and the flowers opening from top downwards (centrifugal). In contrast, *K. foliosa* has a funnel-shaped to tubular perianth, 18–27 mm long, and the flowers are opening from bottom upwards (centripetal).

Description

Plants slender, solitary with erect, corm-like root-stock, with some fibrous remains of leaves at the base. Leaves (15–)30–100 × 0.5–2 cm, linear, dark to greyish green, keeled; keels and margin smooth or minutely tuberculate, but not scabrid. Peduncle (including raceme) 30–90 cm long. Raceme cylindrical, 4–15 cm long (to 18 cm long in fruit), very dense, >15 flowers per cm. Bracts white, lanceolate to ovate-lanceolate, 3–10 × 1.5–5 mm, serrulate. Perianth yellow, orange, pale red to vermillion, campanulate, 9–13 mm long



Fig. 60.
Kniphofia
pumila, from
Wellega.

(14–18 mm long in cultivation) widening at the mouth and only slightly constricting at the base; perianth lobes small, 1–2 × 1–3 mm. Pedicel 1.5–3.5 mm long, elongating to 6 mm long in fruit. Stamens and styles exserted, 10–15 mm long; the stamens spirally twisted on fading. Capsule, 5–9 × 4–6 mm.

Habitat and distribution

The species grows in grassland, grassy slopes, on steep hillsides and near streams in tall grass between 1220 and 2650(–3150) m. It is widespread in Ethiopia and Eritrea. It also occurs in the Sudan, Uganda, and Zaire. The main flowering period in Ethiopia is from August to September, sometimes also in October.



Kniphofia foliosa

2. *Kniphofia foliosa* Hochstetter

The specific epithet '*foliosa*' refers to the many crowded rosulate leaves at the base (*folium* = leaf). The species was described in 1844 from plants collected in Adwa, Tigray region by Schimper.

The species is related to the more widespread *K. pumila*, but it is easily distinguished by the funnel-shaped to tubular perianth, 18–27 mm long; flowers opening from base upwards (centripetal). In contrast, *K. pumila* has a bell-shaped perianth, 10–14(–18) mm long centrifugal flower opening.

Description

Robust plants forming dense clumps, with thick erect rhizomes, sometimes with a stem up to 40 cm long, with some fibrous remains of leaves at the base. Leaves 20–100 × (1.6–)2–4(–7) cm; linear lanceolate, dark to greyish-green, keeled; margin serrulate, keels smooth below; serrulate above. Peduncle (including raceme) 30–150 cm long. Raceme 15–40 cm long (to 50 cm long in fruit), very dense, cylindrical. Bracts white, drying brownish, ovate to ovate-lanceolate, 4–12 × 2.5–3.5 mm, serrulate. Perianth pale yellow, orange or red, cylindrical, 18–27 mm long, widening at the mouth and only slightly constricting at the base; perianth lobes 3.5–6 × 2–3 mm. Pedicel 3–4 mm long. Stamens and style exserted, 8–15 mm long, the stamens spirally twisted when drying. Capsule ovoid, 7–8 × 6 mm.

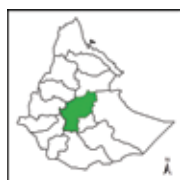
Habitat and distribution

The species grows on roadsides, on overgrazed areas with scattered trees, hillsides, on rock outcrops, and mountain plateaus between 2400 and 4000 m, usually on well drained soil. It is widespread in Ethiopia, but it is not known anywhere else. The main flowering period is from June to October, but it sometimes extends to December–January in wetter places and forest margins.



Fig. 61. *Kniphofia foliosa*, from Semien mountains, Gonder floristic region.

The species often occurs in large populations, e.g. as seen near Sebsebe Washa in Bale, and at Alidoro between Fiche and the Blue Nile Gorge in Shewa.



*Kniphofia
hildebrandtii*

3. *Kniphofia hildebrandtii* Cufodontis

The specific epithet '*hildebrandtii*' was given in honour of the collector, Mr. Hildebrandt from whose collection the type of the species was designated. The species was described by Cufodontis in 1971 from a plant collected in the Shewa Region west of Addis Ababa.

The species is clearly distinguished from the other species by the pale greenish or yellowish white flowers and brown bracts that are not reflexed during or after anthesis.

Description

Plants slender with fibrous remains of leaves at the base. Leaves 30–70 × 0.3–0.6 cm, linear, dark to greyish green, keeled; keels and margin smooth. Peduncle (including raceme), (35–)65–110 cm long. Raceme 13–26 cm long, at flowering, secund, lax. Bracts brown, cuspidate, 6.5–9 × 2–3 mm, serrulate. Perianth white, greenish-white, pale yellow, pendulous, cylindrical, 13–16 mm long, not widening at the mouth and not constricting at the base; perianth lobes small, 0.5–1 mm long. Pedicel slender 4–6 mm long, extending to 7–8 mm long in fruit. Stamens and style only shortly exerted up to 3.5 mm long and stamens eventually withdrawn. Fruit ovoid and pointed, 6 × 5 mm.

Habitat and distribution

So far, the species is known from a relatively restricted area in Shewa region, in wet grassland between 2000 and 3000 m. It is not known from anywhere else. The main flowering period is from June to August.



Kniphofia isoetifolia

4. *Kniphofia isoetifolia* Steudner ex Hochstetter

The specific epithet '*isoetifolia*' refers to the leaves (*folia*) being similar to the non-flowering plant *Isoetes*. The species was described in 1844 from a plant collected in Enchet Kab in the Gonder region by Schimper.

The species is clearly distinguished from the other species by the head-like (capitate) inflorescence. In addition, it is one of the two species (the other is *K. pumila*) that has the flowers opening from top downwards (centrifugal).

Description

Plants slender, usually solitary or sometimes in groups with 5–6 stems with few fibrous remains of leaves at the base. Roots fusiform. Leaves $7\text{--}45 \times 0.2\text{--}1.1$ cm, linear, bluish green, keeled; keels and margin papillate. Peduncle (including raceme) 9–65 cm long. Raceme 4–8 cm long, at flowering, dense or subdense. Bracts white, cuspidate, $7\text{--}12 \times 1\text{--}2.5$ mm. Perianth pale or bright yellow, orange or bright red; pendulous, cylindrical, 30–42 mm long, widening at the mouth and constricting at the base; perianth lobes $2.5\text{--}3 \times 2\text{--}2.5$ mm long. Pedicel slender 2–4 mm long, elongating up to 5 mm long in fruit. Stamens and style only shortly exerted up to 3–4 mm long and stamens eventually withdrawn.

Habitat and distribution

The species grows on overgrazed hill tops and river banks, on steep rocky slopes, and in montane grassland, sometimes in wet meadows between 2050 and 3480 (–3580) m. It is widespread in Ethiopia, but it is not

Fig. 62.
Kniphofia isoetifolia,
from Semien
mountains,
Gonder floristic
region.



known anywhere else. The main flowering period is from June to September.



Kniphofia insignis

5. *Kniphofia insignis* Rendle

The specific epithet '*insignis*' means outstanding, probably referring to the unusual, white inflorescences. The species was described in 1896 from a plant collected from Sheikh Mohammed in the Arsi region by Donaldson Smith.

The species is clearly distinguished from the other species by the white perianth, which is unusual in the genus, and also by the fusiform roots.

Description

Plants slender, solitary without fibrous remains of leaves at the base. Roots fusiform. Leaves 30–100 × 0.3–1.5 cm, linear, glaucous, keeled; keels and margin papillate. Peduncle (including raceme) 20–65 cm long, sometimes up to 100 cm long in cultivation. Raceme 8–22 cm long, at flowering, lax. Bracts white, cuspidate, 12–17 × 2–3 mm. Perianth white, pendulous, cylindrical, 24–28 mm long, widening at the mouth and constricting at the base; perianth lobes 2–3 × 1–2 mm long. Pedicel slender 2.5–4 mm long, elongating to 5 mm long in fruit. Stamens and style only shortly exserted, up to 3



Fig. 63. *Kniphofia insignis*, (left) from near Chanco; (right) from cultivation, both in Shewa floristic region.

mm long, stamens eventually withdrawn. Fruit ovoid and pointed, $8-9 \times 6$ mm.

Habitat and distribution

The species often grows in water-logged or flooded meadows between 2500 and 3100 m. It is so far only known from the Shewa and Arsi region. The main flowering period is from June to September.

The plants occur scattered, and it is commonly seen in the Sululta plains between Addis Ababa and Chanco during its flowering period.



Kniphofia schimperi

6. *Kniphofia schimperi* Baker

The specific epithet '*schimperi*' was given in honour of the famous German collector, George Wilhelm Schimper, from whose collection the type of the species was designated. The species was described by Baker in 1874 from a plant collected from Debre-Tabor in Gonder region.

The species is clearly distinguished from the related species, *K. thomsonii*, by the lax inflorescence, with 1–3 flowers per cm, usually growing towards one side of the inflorescence, and the narrow bracts, only 1.2–2 mm wide.

Description

Plants slender with fibrous remains of leaves at the base. Leaves $30-50 \times 0.4-1$ cm, linear, dark green, keeled; keels and margin minutely papillose-scabrid or smooth. Peduncle (including raceme) 43–130 cm long. Raceme 15–35(–52) cm long, secund, lax, flowers 1–3(–4) per cm. Bracts white, cuspidate, $5-12 \times 1.2-2$ mm. Perianth orange red, pale red to orange, pendulous, cylindrical, 15–26 mm long, widening at the mouth and not constricting at the base; perianth lobes $1.5-2.5 \times 1-2$ mm long. Pedicel slender 1.5–4.5 mm long. Stamens and style only shortly exserted, up to 3.5 mm long, stamens eventually withdrawn. Fruit ovoid, ca. 8×5 mm.

Habitat and distribution

The species grows on steep grassy or stony slopes on rocky outcrops and hillsides between 1500 and 3000 m. It is so far known only from montane areas in Gonder, Gojam, Welo, Shewa, Arsi, and Bale regions in Ethiopia, and in Eritrea. The main flowering period is from July to October.

The species is found as scattered plants within its habitat, as seen on the Entoto ridge north of Addis Ababa on the way to Chanco.

Fig. 64 (left):
Kniphofia
schimperi, from
Entoto, Shewa
floristic region.

Fig. 65 (right):
Kniphofia
thomsonii, from
Mt. Kenya,
Kenya.



Kniphofia thomsonii

7. *Kniphofia thomsonii* Baker

The specific epithet ‘*thomsonii*’ was given in honour of the collector, Thomson, from whose collection the type of the species was designated. The species was described by Baker in 1885 from a plant collected from Kilimanjaro in Tanzania.

The species is clearly distinguished from the related species, *K. schimperi* by the somewhat denser inflorescence, with 5–10 flowers per cm, usually growing on all sides of the inflorescence, and the wider bracts.

Description

Plants slender with fibrous remains of leaves at the base. Leaves linear, keeled; keels and margin minutely papillose-scabrid or smooth. Peduncle (including raceme) 40–65 cm long. Raceme lax to subdense. Bracts white, of variable width. Perianth yellow, orange, lemon-yellow to orange-red, pendulous, cylindrical, 23–25 mm long, widening at the mouth, more or less constricted at the base. Stamens and style only shortly exerted, up to 2.5 mm long, stamens eventually withdrawn.

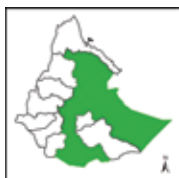
Habitat and distribution

The species grows on steep grassy or rocky slopes and marshy ground between 2400 and 3650 m in the Shewa, Arsi, Bale, Sidamo, and Harerge floristic regions. It also occurs in Kenya and Tanzania. The main flowering period in Ethiopia is from June to September.

2. BULBINE *Wolf*

The genus includes plants with more or less fleshy leaves. The inflorescence is a many-flowered raceme, where the lower pedicels are longer than the upper, making it umbel-like or corymbose. The flowers are bright yellow with free, subequal, spreading, one-veined tepals. The filaments are densely covered with long hairs. The capsules are subglobose, and the seeds are angled and dark brown.

The genus is African, represented by about 50 species, with a centre of diversity in the south. Only one species reaches Ethiopia.



Bulbine abyssinica

Bulbine abyssinica A. Richard

The species epithet refers to *Abyssinia*, the former name of Ethiopia, from where it was described by A. Richard in 1851, based on material from Tigray. The yellow flowers and the hairy filaments make it different from all other lilies of Ethiopia.

Description

Perennial herb, often forming clumps. Leaves $7-30 \times 0.2-0.5$ cm, gradually dilating to a broad sheathing membranaceous base, sometimes covered by fibres. Scapes (including the raceme) 10–50 cm long, several on each plant, erect or curved. Bracts cuspidate, $6-15 \times 2-3$ mm long. Raceme 2.5–20 cm long, dense-flowered in the upper part; pedicel patent to erect, 1.5–2.5 cm long, elongating to 3 cm in fruit. Tepals bright yellow, sometimes with a purplish to reddish-brown stripe on the outside, subequal, $6-9 \times 2-2.5$ mm. Filaments 3–5 mm long, densely covered with long yellow hairs, especially in the middle to upper part; anthers ca. 3 mm. Capsule subglobose, constricted at the base, $3-5 \times 3-4$ mm. Seeds almost smooth, ca. 2.5 mm in diameter.

Habitat and distribution

This species is found in degraded *Acacia* bushland, *Acacia-Combretum* bushland, or in grassland, on reddish-brown loamy soil or on sand between 1200 and 1750 m. It occurs in the Tigray, Welo, Shewa, Sidamo, and Harerge floristic regions. Elsewhere it occurs in Somalia, Kenya, Uganda, Tanzania, Burundi, Rwanda and Zaire. The main flowering period in Ethiopia is from April to May.

Fig. 66. *Bulbine abyssinica*, from Yabello, Sidamo floristic region.



3. JODRELLIA *Baijnath*

The genus includes plants closely related to *Bulbine*, differing in the flower colour, which are pinkish rather than yellow, and the outer tepals that have 3-5 rather than one vein. In 1978 H. Baijnath transferred it to his new genus *Jodrellia*, which is named after the Jodrell Laboratory in Kew, England.

The genus is distributed from Namibia (Kaprivi strip) and Zimbabwe, along Eastern Africa, to Ethiopia and Somalia. It includes two or three species. The taxonomy of the species within the genus is still slightly confused. In Ethiopia there are probably two species, one with non-inflated fruits and almost smooth seeds in the north (*Jodrellia fistulosa*), and another with inflated fruits and warty (verrucose) seeds in the south (*J. macrocarpa*).

Key to the species

- | | |
|--|-------------------------|
| 1. Capsules 4.5–5.5 × 4–5 mm, non-inflated; seed surface almost smooth; pedicels shorter than bracts | 1. <i>J. fistulosa</i> |
| - Capsules 8–15 × 12–22 mm, inflated; seed surface verrucose; pedicels longer than bracts | 2. <i>J. macrocarpa</i> |
-

*Jodrellia fistulosa*

1. *Jodrellia fistulosa* (Chiovenda) Baijnath

The species epithet refers to the '*fistulose*' leaves, meaning that they are cylindrical and hollow. Chiovenda described the species in the genus *Bulbine* in 1911 based on material obtained from Tigray floristic region. It differs from *J. macrocarpa* by its non-inflated capsules and almost smooth seeds. It is, however, possible that the non-inflated fruits in *J. fistulosa* is due to young stage in the only collection from Ethiopia, and that only one species occurs in the area.

Description

Erect perennial herb 30–40 cm tall. Leaves glabrous, terete to fistulose, up to 55×0.8 cm, gradually dilating to a broad sheathing base. Inflorescence racemose. Scape (including the raceme) 12–30 cm long, shorter than the leaves. Raceme dense, 15–40-flowered, 1.5–7 cm long. Bracts 5–14 mm $\times$ 1.5–4 mm, whitish, transparent, lanceolate, apex filiform. Pedicels 5–10 mm long, slender, recurved after flowering. Tepals whitish to pinkish, with slightly cucullate apex; outer segments, 6×2 mm, 3-nerved; inner ones 5×1 mm, 1-nerved. Ovary obovoid with papillose stigma, 3-locular with 2 ovules in each locule. Capsule 4–5 $\times$ 3–4 mm long, not inflated. Seeds few, dark-brown to black, slightly angled, dark brown, almost smooth, c. 2 mm across, with a hook.

Habitat and distribution

The species has been collected close to rivers around 900 m. So far it is only known from the Tigray floristic region (Tekeze river valley) and from Eritrea. According to the monographer of the genus, Baijnath, the Ethiopian-Somalian plants are conspecific with plants collected in Tanzania, Zambia, Zimbabwe and Namibia (the Kaprivi Strip), but more comparative studies are needed. The Ethiopian plants have not been collected during their flowering period, but fruiting plants are recorded in August.

Notes

Baijnath regarded *J. fistulosa* to be conspecific also with *J. migiurtina* (Chiov.) Baijnath, described from Somalia. If the two species turn out to be conspecific, *J. fistulosa*, the older name will have priority.

*Jodrellia macrocarpa*

2. *Jodrellia macrocarpa* Baijnath

The species epithet '*macrocarpa*' refers to the inflated fruits (in Greek, *macro* = large, *carpus* = fruit). It was described in 1978 by Baijnath based on material from Northern Kenya. It differs from the other species by its



Fig. 67. *Jodrellia macrocarpa*, from Sof Omar, Bale floristic region.

inflated fruits and warty (verrucose) seeds. In the Flora of Ethiopia and Eritrea this species was wrongly referred to *Jodrellia miguirtina* (Chiov.) Baijnath, a species described from Somalia. Mats Thulin, who revised the genus for the Flora of Somalia, observed, however, that this species apparently has smooth seeds. The difference between *J. fistulosa* and *J. miguirtina* thus becomes unclear. And if the postulated non-inflated fruits of *J. fistulosa* turn out to be due to the young stage of the only known collection in Ethiopia (see above), then also *J. macrocarpa* will have to be sunk into *J. fistulosa*. More studies are needed!

Description

Erect perennial herb 15–40 cm tall. Rhizome short with many fleshy roots. Leaves glabrous succulent, terete, $20\text{--}38 \times 0.2\text{--}0.6$ cm. Inflorescence racemose. Scape (including the inflorescence) 7–18 cm long, shorter than the leaves. Raceme 2–6 cm long, dense; pedicels 8.5–16 mm long, slender, recurved. Bracts white, transparent, $4\text{--}5(-8) \times 1\text{--}2$ mm, lanceolate, cuspidate. Tepals whitish to pinkish, with apex slightly cucullate, outer, $3\text{--}5 \times 1\text{--}1.5$ mm, narrowly elliptical, 3–5-veined; inner $3\text{--}4.5 \times 0.6\text{--}1$ mm, one-veined. Filaments ca. 2 mm long, densely covered with long hairs in the apical part; anthers c. 2 mm. Capsule inflated and globose, $8\text{--}15 \times 8\text{--}15$ mm, indehiscent (?); seeds 1–2 dark-brown, $4\text{--}4.5 \times 2\text{--}2.5$ mm, with verrucose surface.

Habitat and distribution

The plants grow on rocky slopes with mixed woodland of *Acacia*, *Commiphora*, and *Delonix*, around 900 m. It is a near-endemic species, only known from the Bale floristic region and the adjacent parts of Somalia and Northern Kenya. The species has only been collected in the fruiting stage from April to May, thus it probably flowers sometimes in March to April.

4. TRACHYANDRA *Kunth*

The genus includes grass-like pubescent plants, growing from a vertical rhizome with fleshy roots. There are several inflorescences per plant. The flowers are open, star-like, with subequal, one-nerved, white tepals. The stamens are subequal, the filaments scabrid, but never hairy. The capsules are subglobose, with few to many seeds.

The genus is predominantly South African, with about 50 species, of which most are endemic in the winter rainfall areas in south-western Cape. Only one species reaches north of the equator and to Ethiopia and Yemen.



Trachyandra saltii

Trachyandra saltii (Baker) Oberm.

The species epithet refers to the collector, Salt, who collected the plant somewhere in Ethiopia; precise locality not known. It was described by Baker as a species in the genus *Anthericum* in 1876, and transferred to *Trachyandra* by Obermeyer in 1962. This species looks superficially like an *Anthericum*, but it has the typical Asphodelaceae traits in chemistry and seeds.

Description

Short vertical rhizome with many fleshy roots and sometimes with fibres from previous years leaves. Leaves, up to 35 × 0.4 cm, slightly olive-green, filiform to linear, gradually expanding to broad sheathing membranaceous base, more or less pubescent with long white hairs. Scapes (including the inflorescence) pubescent, 13–45 cm long, curved near the base. Raceme lax; bracts narrow, cuspidate, up to 10 mm long; pedicels 8–15(–20) mm long, patent or recurved, elongating somewhat in fruit. Tepals white, c. 10 mm long, with a brownish dorsal median band; stamens slightly shorter than the tepals, anthers light yellow, ca. 1 mm long. Capsule subglobose, c. 5 mm in diameter, constricted at the base, with dull, greyish, angled seeds.



Fig. 68. *Trachyandra saltii*, from cultivation in Addis Ababa, original material obtained from Sidamo floristic region.

Habitat and distribution This species is found in *Acacia-Commiphora-Terminalia* woodland, bushland, in grassland with scattered trees, on rocky outcrops, or in disturbed *Juniperus procera* woodland. It grows on eroded sandy soils, red loamy soil, or black cotton soil, between 1250 and 2100 m. It occurs in the Sidamo, Bale, and Harerge floristic regions, and it is otherwise widespread from Cape in the south through the eastern parts of Africa, north to Yemen. The main flowering period in Ethiopia is from March to May, in the south also with a second period from November to January.

ANTHERICACEAE

In this family the underground organ is a rhizome or corm (never a bulb), which, when cut, is whitish (never yellowish) inside. The leaves are organised in a basal rosette, sometimes in two ranks (distichous). The peduncle (scape) is most often leafless, but may also carry leaves (as in *Chlorophytum longifolium* and *C. ducis-aprutii*). The inflorescence is branched (paniculate) or unbranched (racemose or spicate). The flowers are regular to slightly irregular with free tepals, white or whitish, often with a green, red or brown keel. The stamens have filiform to fusiform filaments, and the anthers open with splits inwards (introrse dehiscence). The ovary is subdivided in three chambers with several ovules per chamber, fixed on a central column (axile placentation). The style is slender with a small stigma. The fruit is a capsule that opens by three slits between the three septa (loculicidal dehiscence). The seeds are black, often glossy, and may also be papillose.

Distribution and classification

Anthericaceae is a tropical and temperate family with 9 genera and *c.* 200 species, distributed mainly in Africa, Europe, Asia and the Americas, extending to North Australia. Two of the genera occur in Africa. In Ethiopia and Eritrea *ca.* 30 species have been found. The family is closely related to Asphodelaceae, and it may sometimes be difficult to distinguish on gross morphology. The genus *Trachyandra*, which is now included in Asphodelaceae, was in fact up to the 1960's included in the genus *Anthericum*. However, representatives of Asphodelaceae always contain anthraquinones, a yellow coloured chemical compound, which is revealed when the rhizome is cut; in Anthericaceae the rhizomes are whitish inside. The seeds of Asphodelaceae have an extra cell layer (aril) covering the black seed coat, making the seeds dull greyish, not black and glossy as in Anthericaceae.

Reproduction

The walls separating the three chambers of the ovaries contain nectar producing areas (sepal glands). The

nectar is excreted from small pores and gathers in the bottom of the flowers. There does not seem to be any sophisticated pollination adaptations, and the flowers are probably pollinated by flies and bees (or some of the small flowered species might be self-pollinated).

The capsules open by splits from the top and the seed dispersal mechanism is probably ballistic, meaning that the seeds are held on the mother plant until a strong blow from the outside releases the seeds. Some species, however, release the seeds on the ground, possibly for small animals to carry them further away.

Chemistry and use The flowers of most species are not particularly showy, and with few exceptions the plants are not grown as ornamentals. One exception is *Chlorophytum comosum*, 'the mother and child plant', which is grown for the foliage (often variegated, yellow and green striped) and for the small plantlets that develop from the inflorescence.

Steroidal saponins are common in the family and cyanogenic glycosides are reported from *Chlorophytum*, both substances probably reduce herbivory.

Conservation Six of the species in this family are strictly endemic to Ethiopia/Eritrea, i.e. *Anthericum neghellense*, *Chlorophytum ducis-aprutii*, *C. herrmanni*, *C. pseudocaule*, *C. pterocarpum*, and *C. serpens*. In addition, seven species are near-endemic, only occurring in adjacent localities in Kenya, Somalia and Yemen, i.e. *Anthericum jamesii*, *A. tetraphyllum*, *Chlorophytum bifolium*, *C. inconspicuum*, *C. zavattarii*, *C. humifusum*, and *C. pendulum*. Ethiopia has a special responsibility to survey and conserve these species, which constitute c. 40% of the species of the family in the study area. The Horn of Africa represents an important centre of diversity for the family Anthericaceae.

As far as we know, the plants are neither sought after as ornamentals, nor have they been utilised in Ethiopia as medicine or food. The only threat to the species is probably habitat destruction. Species that only exist in a single locality, as e.g. *C. pterocarpum*, are certainly vulnerable.

Key to the genera

1. Roots somewhat swollen rarely with tubers; if there are more than one flower at a node, the number of flowers equals the number of bracts; pedicels without a joint (not articulated); seeds $\pm$ solid or turgid 1. *Anthericum*
- Roots swollen or if not, carrying tubers; flowers most often more than one at each node of the inflorescence or, if only one, supported by two bracts; pedicels most often with a joint (articulated); seeds $\pm$ thin, flat or folded 2. *Chlorophytum*

1. ANTHERICUM L.

The genus includes small plants, up to 20 cm tall. The rhizome is very short and the roots more or less swollen sometimes with distal tubers. The leaves are linear to lanceolate, sometimes slightly succulent. The peduncles, often several to a plant, are reduced (in *A. angustifolium* and *A. tetraphyllum*), or stepwise contracted (in *A. neghellense*). The flowers are in umbel-like or in racemose inflorescences. The pedicels lack the joint (articulation) that characterises most species of *Chlorophytum*. The tepals are white, often with a green keel. The capsules are rounded or shallowly three-lobed in cross section. The seeds are $\pm$ turgid.

The delimitation of this genus in relation to *Chlorophytum* has varied much through time. Several species were transferred from *Anthericum* to *Chlorophytum* by Kativu & Nordal (1993). And recently, two species that were referred to *Chlorophytum* in the first edition of this book and in the Flora of Ethiopia and Eritrea (Nordal 1997), have been transferred to *Anthericum*: *A. neghellense* (Cufodontis) Bjorå & Sebsebe and *A. tetraphyllum* (L.f.) Nordal & Sebsebe. As circumscribed at present, the genus belongs mainly in the temperate to subtropical parts of the Old World and includes ca. 10 species. Recent molecular analyses might indicate that the African species of *Anthericum* do not belong in the same monophyletic group as the two common European ones, *A. racemosum* L. and *A. liliago* L. (Bjorå 2008). In that case the African ones will have to be referred to a new genus. More work is needed. In American floras the genus *Anthericum* is also reported to occur also in

the New World, but these species should probably be referred to another genus. Five species of *Anthericum* occur in Tropical Africa south to northern Tanzania, all of them are found in Ethiopia. All of them appear to be connected to $\pm$ disturbed habitats, and speciation might have taken place in the Horn of Africa in relation to human activities.

Key to the species

1. Peduncle completely reduced (rarely up to 1 cm) ; inflorescence $\pm$ umbel-like with pedicels, (15–) 25–80 mm long, emerging directly from the the leaf rosette 2
 - Peduncle distinct, (2–) 3–15 cm long; inflorescence racemose, unbranched or with few basal branches, pedicels shorter than 25 mm long 3
2. Leaves 1–3 cm wide; peduncle up to 1 cm long; pedicels (15–) 25–30 mm long 4. *A. tetraphyllum*
 - Leaves up to 0,5 cm wide; peduncle completely reduced; pedicels 30–80 mm long 5. *A. angustifolium*
3. Peduncles erect, inflorescence an ordinary raceme, without contractions 4
 - Peduncles prostrate, inflorescence with partially contracted internodes 3. *A. neghellense*
4. Leaves ca. 0.5 cm wide, slightly succulent and tubular; inflorescence never branched; capsules slightly ridged, but not verrucose (i.e. without wart-like outgrowths) 1. *A. corymbosum*
 - Leaves ca. 1cm wide, flat; inflorescence often with 1–3 basal branches; capsules verrucose (i.e. with wart-like outgrowths) 2. *A. jamesii*



*Anthericum
corymbosum*

1. *Anthericum corymbosum* Baker

The specific epithet '*corymbosum*' refers to the inflorescence, a *corymb*, which is a kind of raceme where the lower pedicels are much longer than the upper ones. The species was described by Baker in 1877, based on material from Somalia, collected by Hildebrandt. It is easily recognised from *Anthericum angustifolium* and *A. tetraphyllum* by the distinct peduncle and the racemose inflorescence and from *A. neghellense* by its erect peduncle.

Description Plants 10–20 cm high. Leaves linear, $5\text{--}25 \times 0.2\text{--}0.8$ cm, often ciliate margins, more or less succulent. Peduncles often several to a plant, 3–15 cm long, glabrous. Inflorescence a simple raceme, 3–6 cm long with 3–12 flowers. Pedicels semi-patent, 5–25 mm long, elongating to 40 mm with age. Flowers white with green stripes on the outside; tepals $9\text{--}10 \times 2\text{--}3$ mm. Capsule slightly ridged, but not verrucose, 4–8 mm long, subglobose with a rounded triangular cross section. Seeds 2–3 mm in diameter.

Habitat and distribution The species grows in clumps in grassland, bushland and more or less degraded *Acacia-Combretum* woodland, also in destroyed former *Juniperus* forest; on black soils, seasonally waterlogged, or on lighter brownish to reddish soils; often in areas heavily grazed and eroded, between 1000 and 2850 m. It is recorded in the Harerge, Bale and Sidamo floristic regions. It has otherwise been recorded from Somalia, Kenya and Northern Tanzania. The flowering period in Ethiopia appears to be two-peaked; flowering specimens have been collected in April and in November.



Anthericum jamesii

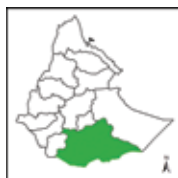
2. *Anthericum jamesii* Baker

The species epithet '*jamesii*' refers to one of the two persons who collected the plant for the first time, that are the pioneers James and Thrupp, in Somalia in the late 19th century. It was described by Baker in 1898, and it has only rarely been collected later.

Description Plants, up to 15 cm. Leaves sheathing into a neck, 3–5 cm long, linear, $10\text{--}15 \times \text{ca. } 1$ cm, with scabrid margins. Peduncle (above the neck) 2–4 cm long. Inflorescence a raceme, often with one or two basal branches, 5–10 cm long with 10–15 flowers. Pedicels semipatent, c. 10 mm long at anthesis, elongating with age. Flowers similar to those of *A. corymbosum*. Capsules distinctly verrucose, otherwise similar to those of *A. corymbosum*.

Habitat and distribution This is a rare species growing in clearings in bush, temporarily waterlogged on red sandy soil around 800 m, in the Harerge floristic region, and it is otherwise only known from adjacent parts of Somalia and Kenya. Flowering specimens have only been observed in October.

Fig. 69.
Anthericum
neghellense,
from near
Negelle, Sidamo
floristic region.



Anthericum
neghellense

3. *Anthericum neghellense* (*Cufodontis*) Bjorå & Sebsebe

The species epithet refers to Negelle, a township in the Sidamo region, from where Cufodontis collected the plant which he described in the genus *Chlorophytum* in 1939. Molecular analyses and a further analyses of the inflorescence morphology have revealed that it belongs in a monophyletic group together with the other African representatives of *Anthericum*. Bjorå & Sebsebe have accordingly made the formal transfer to the genus where it belongs. It can be recognised from the other *Anthericum* species by its completely prostrate life form, i.e. leaves, flowers and fruits lying flat on the ground (which might be an adaption to avoid herbivory).

Description

Small prostrate plants. Rhizome horizontal with fiber remnants from old leaves; roots thin with small (ca. 1×0.3 cm) tubers on lateral root branches. Leaves rosulate, lanceolate, obtuse with a hyaline, ciliate, often crisply undulate margin, $6\text{--}20 \times 1.5\text{--}2.5$ cm. Peduncle 2–3 (–5) cm, prostrate. Inflorescence unbranched, or rarely with one basal branch, 4–12 cm long, flat on the ground. Bracts large and leaf-like, with several veins, ciliate margin, up to 15×5 mm. Flowers 2–4 at each node. Pedicels curved, c. 10 mm at anthesis, elongating in fruit stage. Flowers white, tepals patent, c. 8 mm long with 3–5 veins. Stamens shorter than the tepals, and filaments c. 4 mm, anthers shorter and coiled after anthesis. Infrutescence more or less hidden under the leaves; capsules trigonous, slightly ridged, $6\text{--}8 \times 4\text{--}5$ mm, seeds irregularly folded, 2 mm across.

Habitat and distribution

The species belongs in *Acacia-Combretum-Commiphora* dominated woodland to degraded bushland, often heavily

grazed, on red (rarely black) sandy soils between 1050 and 1700 m. It only occurs in Sidamo and Bale floristic regions, not known anywhere else. The main flowering period is two-peaked, like in other south Ethiopian geophytes, March to April and October to November. The fruits and seeds are hidden under the leaves of the mother plant, indicating some kind of dispersal mechanism by ants or other small animals. More studies are needed.



*Anthericum
tetraphyllum*

4. *Anthericum tetraphyllum* (L.f.) Nordal & Sebsebe

The species epithet ‘tetraphyllum’ means four-leaved, although this is not an absolute trait, the number will most often be more than four. It was described as early as 1781 by the son of Linnaeus, based on material from Yemen. He placed it in the genus *Scilla*. It was later transferred to *Chlorophytum* by Baker in 1876. Recent analyses have shown that it belongs in a group of African *Anthericum* species, to which it has been transferred by Nordal and Sebsebe (2010). It appears to be closest related to *A. neghellense*, but the inflorescence is not prostrate, but it is more contracted. The two species share the trait of having fruits and seeds hidden below the leaves.

Description

Small plants. Rhizome short; roots swollen, often also with elongated tubers up to 4 cm long. Leaves rosulate, lanceolate, acute, with a hyaline ciliate margin, $3-25 \times 1-3$ cm. Peduncle reduced, hidden amongst the leaf bases. Floral bracts large and leaf-like, with several strong veins, $20-40 \times 2-4$ mm. Rachis most often reduced making the inflorescence umbel-like, sometimes a few umbel-like clusters along an up to 1 cm axis. Pedicels recurved, (15-) 25-30 mm. Flowers white, tepals patent to reflexed, 6-8 mm, 3-veined. Stamens



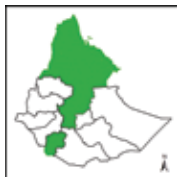
Fig. 70.
*Anthericum
tetraphyllum*,
from Entoto,
Shewa floristic
region.

shorter than the tepals, and filaments longer than the anthers which are bright orange. Capsules subglobose, slightly trigonous, ca. 3 mm long. Seeds irregularly folded, ca. 1 mm across.

Habitat and distribution

This species is found in open scrub or grassland on reddish or blackish heavy soils, often in degraded and overgrazed habitats between 1250 and 3400 m. It is widespread in Ethiopia, recorded from the Tigray, Gonder, Gojam, Welo, Shewa, Arsi, Wellega, Sidamo and Bale floristic regions. Otherwise it is only known from Eritrea and Yemen.

With the tolerance for heavy disturbance and the wide distribution within Ethiopia, it is interesting that it has (almost) not reached outside Ethiopia/Eritrea. The species might have originated with the very early human influence in the region, and with its restricted potential for dispersal it has remained a near-endemic plant. Species that may grow in over-exploited areas represent interesting genetic resources for revegetation and rehabilitation of heavily degraded areas. The flowering period is from April to July.



*Anthericum
angustifolium*

5. *Anthericum angustifolium* Hochst. ex A. Rich.

The specific epithet '*angustifolium*' refers to the narrow leaves. The species was named by Hochstetter and published by Richard in 1851, based on material from Tigray, collected by a French botanist, Quartin-Dillon.

Description

Small plants up to 10 cm. Leaves linear, $5-10 \times 0.2-0.5$ cm, glabrous or with ciliate margins. Peduncle very short and hidden among the leaves; rachis almost completely reduced, making the inflorescence umbel-like rather than racemose. Pedicels 30–80 mm long. Flowers white, slightly greenish outside, star-like, 1–10 to a plant; tepals $8-12 \times 2-3$ mm, three-veined. Stamens shorter than the tepals, with filaments ca. 4 mm, and longer than the yellow anthers, which are



Fig. 71.
*Anthericum
angustifolium*,
from Debre
Libanos. Shewa
floristic region.

curled after anthesis. Capsules 5–8 mm long, subglobose, smooth or slightly ridged, on reflexed pedicels so that they end up lying on the ground. Seeds *c.* 2 mm in diameter.

Habitat and distribution

The species grows in clumps in upland grassland, seasonally waterlogged, often heavily grazed and eroded, on black shallow soils; mainly between 2000 and 3000 m. It is recorded from the Tigray, Gonder, Welo, Shewa, and Gamo Gofa floristic regions in Ethiopia and from Eritrea. It is otherwise known from Uganda and Kenya. The flowering period in Ethiopia is from July to August. The fact that the plants release the seeds at ground level might indicate ant dispersal, a possibility which should be further analysed.

2. CHLOROPHYTUM *Ker-Gawl.*

The plants are very variable in size and robustness, reaching from 5 cm to more than 1 m. The rhizome is reduced or prominent, sometimes moniliform (that is consisting of a series of attached corms in a chain); roots either swollen without tubers or more or less wiry with distinct tubers. The basal leaves are organised in rosettes or in two ranks (distichous), linear to broadly lanceolate, sometimes narrowed towards the base to a pseudopetiole (denoted ‘petiolate’). The peduncles are leafless or they carry leaves. The inflorescence is spicate, racemose or paniculate and complicated in the sense that each node carries more than one bract and most often also more than one flower. In contrast to *Anthericum* species with complex nodes (as in e.g. *A. neghellense*), the nodes always display one more bract than number of flowers (in *Anthericum* the number of bracts equals the number of flowers). This phenomenon indicates that the present species of *Chlorophytum* might have evolved from ancestral species with richly branched inflorescences that have undergone reductions and contractions of lateral branches. The pedicels, with very few exceptions, have a distinct joint (articulation), which may represent the remnants of former bracts, again reduced through evolution. The tepals are white, with or without greenish or reddish stripes on the outside. The capsules are more or less triangular (trigonus) to deeply three-lobed (triquetrous) in cross section. The seeds are thin, flat or

sharply folded. By the traits of the multibracteate nodes, the articulated pedicels, and the thin flat to folded seeds, *Chlorophytum* is more or less easily distinguished from *Anthericum*.

Chlorophytum is an Old World tropical genus with about 150 species, and with the main center of diversity in Tropical Africa. Since the treatment of the genus in the Flora of Ethiopia and Eritrea (Nordal 1997), the widespread, mainly West African rainforest species, *C. filipendulum* Baker has been recorded in the Kefa region, and three new species have been described from the Wellega region (*C. herrmanni* Nordal & Sebsebe, *C. serpens* Sebsebe & Nordal and *C. pseudocaule* Tesfaye & Nordal). Two species, *C. neghellense* Cufodontis and *C. tetraphyllum* (L.f.) Baker, have been transferred to *Anthericum*, making the number species of *Chlorophytum* in Ethiopia and Eritrea, 25. The species *C. tordense* Chiov. of the Flora has in the meantime been reduced to *C. affine* Baker.

Key to the species

1. Pedicels apparently without a joint; peduncle less than 3 cm long; the flowers and fruits appearing within the leaf rosette 1. *C. geophilum*
- Pedicels with a joint (difficult to see when it is situated immediately below the flower, as in *C. longifolium* and *C. silvaticum*), peduncle most often longer than 3 cm (shorter in *C. inconspicuum*) 2
2. Peduncle with leaves all along its length 3
- Peduncles without leaves, except occasionally 1-2 sterile bracts just below the inflorescence. 5
3. Inflorescence papillate or pubescent; flowers bell-shaped; tepals covering the ovary at anthesis, papillate on the inside just above the ovary 2. *C. longifolium*
- Inflorescence glabrous; flowers open, star-shaped; tepals not covering the ovary at anthesis, not papillate 4
4. Leaves produced with the flowers; capsules not ridged, triquetrous, deeply three-lobed in cross-section; seeds flat 4. *C. ducis-aprutii*
- Leaves produced after the flowers; capsules transversely ridged, trigonous with shallow lobes in cross-section; seeds irregularly folded 5. *C. nubicum*
5. All nodes of the inflorescence with a single flower (rarely 2 flowers at the lowermost node in *C. bifolium*) 6

- At least some of the lower nodes of the inflorescence with 2 or more flowers 10
- 6. Flowers subsessile, the very short pedicels articulated at the apex; perianth $\pm$ bell-shaped, tepals erect and papillate inside in a zone just above the ovary, each tepal with 1 vein. **3. C. silvaticum**
- Flowers distinctly pedicellate, the pedicels articulated below the apex; perianth glabrous with $\pm$ patent tepals, each with 3 veins. 7
- 7. Flowers zygomorphic with tepals longer than 10 mm; capsule usually at least 10 mm long **6. C. somaliense**
- Flowers regular with tepals shorter than 7 mm; capsule less than 8 mm long 8
- 8. Plants with trailing inflorescence axis, longer than 10 cm; plantlets present in the inflorescence ('pseudovivipary') **22. C. serpens**
- Plants with erect inflorescences axis, shorter than 7 cm, plantlets absent in the inflorescence 9
- 9. Pedicels articulated near the middle; inflorescence $\pm$ pubescent; capsules trigonous with shallow lobes; seeds about 2 mm wide **7. C. bifolium**
- Pedicels articulated near the apex; inflorescence glabrous; capsules triquetrous with winglike compartments; seeds 3–4 mm wide **8. C. pterocarpum**
- 10. Leaves filiform, 0.1–0.3 cm wide, folded; tepals up to 5 mm long **9. C. inconspicuum**
- Leaves lanceolate, more than 0.3 cm wide; tepals more than 5 mm long 11
- 11. Tepals 6–9 mm wide, with 9 or more veins **10. C. tuberosum**
- Tepals less than 6 mm wide, with 3–5(–7) veins 12
- 12. Pedicels stiffly patent, with joint in the upper part, the lower ones more than 15 mm long **11. C. zavattarii**
- Pedicels not stiffly patent, with joint near the middle or in the lower half, up to 10 mm long 13
- 13. Peduncle and inflorescence prostrate, displaying the flowers on the ground 14
- Peduncle and inflorescence erect, flowers displayed above-ground 15
- 14. Roots wiry with tubers on short lateral branches; leaves distichous, glabrous up to 1 cm wide; inflorescence unbranched (rarely with one basal branch); bracts inconspicuous, up to 4 mm long **12. C. humifusum**
- Roots fleshy without tubers; leaves rosulate with cilia along margins and on the nerves below, more than 2 cm wide; inflorescence much branched; bracts large, more than 1 cm long **13. C. herrmannii**

15. Roots wiry with tubers on short lateral branches; flowers greenish 16
- Root tubers as swellings in the distal parts of the roots, not on lateral branches, or roots fusiform and fleshy without tubers; flowers whitish to brownish 17
16. Leaves produced with the flowers; tepals 5–7 mm long 14. *C. gallabatense*
- Leaves produced after the flowers; tepals up to 5 mm long 15. *C. micranthum*
17. Pedicels ± drooping at anthesis, completely drooping in fruit, capsules pendant, pyramide shaped. 16. *C. pendulum*
- Pedicels patent to erect at all stages, capsules erect, shaped differently 18
18. Leaves distichous; seeds irregularly folded 19
- Leaves rosulate; seeds flat to saucershaped 21
19. Roots fleshy, fusiform, without tubers 17. *C. subpetiolatum*
- Roots thin, wiry with distal tubers 20
20. Leaves up to 0.6 cm wide; peduncle pubescent; tepals less than 10 mm long, with 3 veins 18. *C. affine*
- Leaves usually more than 0.6 cm wide; peduncle glabrous; tepals 15 mm or more long, with 5–7 veins 19. *C. cameranii*
21. Leaf bases producing a prominent pseudostem up to 40 cm long; roots, thick spongy without tubers 20. *C. pseudocaulis*
- Leaf bases not forming prominent pseudostem; roots medium thick with elongated tubers 22
22. Inflorescence elongated to up 75 cm, lax, with internodes 1–2 cm long; often with small plantlets at the nodes ('pseudovivipary'); capsules up to 5 (–6) cm long 21. *C. comosum*
- Inflorescence up to 40 (rarely 50) cm long, dense, with internodes less than 1 cm long; without small plantlets in the inflorescence; capsules (5–) 6–10 mm 23
23. Plants drying yellowish to brownish; pedicels 9 mm or longer; tepals longer than 9 mm, capsules triangular in cross section 23. *C. macrophyllum*
- Plants drying blackish; pedicels shorter than 9 mm; tepals shorter than 9 mm; capsules deeply 3-lobed in cross section 24
24. Plants without ciliate basal leaves (cataphylls); leaves petiolate, margin at most scabrous, never ciliate 24. *C. filipendulum*
- Plants with ciliate cataphylls; leaves without a petiole, margin ciliate; recorded from the Tigray, Gojam and Illubabor 25. *C. blepharophyllum*
-



*Chlorophytum
geophilum*

1. *Chlorophytum geophilum* Poellnitz

This species was described by the German botanist von Poellnitz in 1943, based on specimens from Tanzania. The species epithet (*geo*=earth, soil; *philum*=loving) refers to the prostrate growth habit and reduced peduncle, inferring that all parts of the plants will be close to the ground.

Description

Plants up to 5 cm high. Rhizome short, carrying thin roots with elongated tubers. Leaves in a prostrate rosette, lanceolate, petiolate, glabrous, up to 20 cm long and 4–8 cm wide with prominent veins. Peduncle, if present, shorter than 2 cm, so that the inflorescence appears at ground-level among the leaves. Inflorescence up to 5 cm long, dense, often branched, sometimes looking almost capitate; floral bracts large up to 10 mm long, often ciliate. Pedicels apparently without a joint, *c.* 5 mm long, often reflexed in fruit, several at a node. Perianth whitish, tepals 6–8 mm long, with 5 veins; stamens as long as the tepals; anthers *c.* 2 mm long, shorter than the filiform filaments. Capsule shallowly trigonous in cross section, *c.* 5 mm long and 4 mm wide, smooth. Seeds saucer-shaped, 2 mm in diameter.

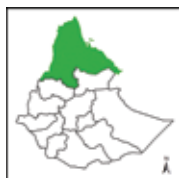
Habitat and distribution

The species is rare in Ethiopia, so far only found in the Gambella area (Illubabor floristic region) and in the Tekeze Valley (Gonder floristic region). It grows in clumps in ± bare patches in grassland and woodland between 550 and 1000 m. It is widespread in the savanna region of Tropical Africa, west to Burkina Faso and south



Fig. 72. *Chlorophytum geophilum*, from Tekeze, Gonder floristic region.

to Malawi and Zambia. The flowering period is from August to October. A closely related widespread species described from the Sudan, *C. pusillum* Baker, might also occur in Ethiopia. This species has spongy roots, shorter pedicels and tepals with 5 veins. More studies are necessary.



*Chlorophytum
longifolium*

2. *Chlorophytum longifolium* Schweinf. ex Baker

The species epithet 'longifolium' refers to the long leaves of this species, and with leaves up to 50 cm, they are certainly above the average in the genus. The description was based on plants from Tigray (Beless) collected by Quartin-Dillon. The species is easily distinguished among the Ethiopian *Chlorophytum* species, by its spicate, pubescent/papillate inflorescence and bell-shaped flowers. It is related to *C. silvaticum*, in Ethiopia only known from Sidamo floristic region, but the latter is smaller, only 10–15 cm high, glabrous and has only one flower per node in the inflorescence, *C. longifolium* is taller than 50 cm, with papillate inflorescence and 2–5 flowers per node. The two species were earlier referred to a separate genus *Dasystachys*, characterized by bell-shaped flowers.

Description

Plants 50–105 cm high. Rhizome thick, horizontal, moniliform, up to 10 cm long; roots spongy, often swollen towards the tips. Leaves rosulate, linear, to narrow lanceolate, often canaliculate, 20–50 × 1–2.2 cm, with undulate ciliate margins. Peduncle terete, glabrous below, densely papillate above, with up to 15 cm leaves all along its length. Inflorescence simple, spicate or with 1–3 basal branches, flowers congested. Pedicels from 1 to 5 at each node, ca. 5 mm long in fruit, articulated at the apex. Perianth white, united at the base, bell-shaped, tepals 3-veined, scabrid at the tips, densely glandular papillate on the inside especially above the ovary. Stamens exserted; filaments fusiform, longer than the anthers; style declinate, as long as the stamens. Capsule oblong, deeply three-lobed, up to 10 mm long, smooth. Seeds disc-shaped, c. 4 mm across.

Habitat and distribution

The species is rare in Ethiopia, only found in woodland between 1400 and 2000 m in the Tigray and Gonder floristic regions in Ethiopia and in Eritrea. Outside Ethiopia, however, it is widespread in Tanzania, Zambia, Zimbabwe, Botswana and Namibia. It has only been collected in the fruit stage in Ethiopia (August), indicating a flowering period May to July.



*Chlorophytum
silvaticum*

3. *Chlorophytum silvaticum* Dammer

The species epithet refers to *silva* = forest (forest might also mean woodland, the species is not a typical forest species). It was described by the German botanist Dammer, based on material collected in Tanzania. It shares flower and fruit characters with *C. longifolium*, and was also earlier referred to a separate genus, *Dasystachys* (see above).

Description

Plants 10–25 cm high. Rhizome short; roots spongy, occasionally reduced to sessile or subsessile tubers. Leaves rosulate, linear to narrow lanceolate, often canaliculate, with undulate ciliate margins, 5–15 × 0.5–1 cm. Peduncle without leaves, up to 10 cm long, glabrous below, to slightly pubescent above. Inflorescence dense, spicate, 2–5 cm long. Floral bracts up to 5 mm, ciliate. Pedicels articulated at the apex, short 1–3 mm long, solitary at the nodes. Perianth white, united at the base, bell-shaped, tepals 1-veined, scabrid at the tips, densely glandular papillate on the inside especially above the ovary. Stamens exserted; filaments fusiform, longer than the anthers; style straight, as long as the stamens. Capsule oblong, deeply three-lobed, 2–4 mm long, 3–6 mm wide. Seeds disc-shaped, ca. 2–3 mm across.

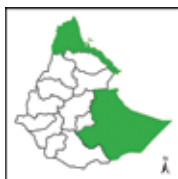
Habitat and distribution

The species grows in degraded *Acacia-Commiphora* woodland or in remnants of *Juniperus* forests on red sandy soil between 850 and 1900 m. In Ethiopia it is so far only recorded in the Sidamo floristic region, but is



Fig. 73. *Chlorophytum silvaticum*, from near Yabello, Sidamo floristic region.

otherwise widespread in eastern tropical Africa south to Zimbabwe and Mozambique. Flowering time in Ethiopia is April to May.



Chlorophytum ducis-aprutii

4. *Chlorophytum ducis-aprutii* Chiovenda

The species epithet refers to the Italian Duce Aprut, whom Chiovenda wanted to honour, when describing the species in 1929, based on material from the Bale floristic region. It is distinguished from all other Ethiopian *Chlorophytum* species by its size, 60–200 cm high. It has leaves all along the peduncle (like *C. nubicum*, which unlike *C. ducis-aprutii* produces the flowers before the leaves, and *C. longifolium*, which differs by its spicate, papillate inflorescence and bell-shaped flowers). It has

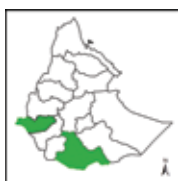


Figur 74.
Chlorophytum ducis-aprutii,
in cultivation ,
original material
obtained from
Bale floristic
region.

large flowers, 2.5–3.5 cm in diameter, compared to most other *Chlorophytum* species.

Description Very robust plants 60–200 cm tall, from a thick moniliform rhizome, roots spongy without tubers. Leaves several, basal, distichous (might appear more rosulate in older stages), linear to narrow lanceolate $45\text{--}105 \times 1.5\text{--}3$ cm, acute, sheathing below, margin often shortly ciliate, with a more or less distinct midrib. Peduncle glabrous, up to 1 m long and with a diameter of about 1 cm at the base, with clasping leaves 4–15 cm long. Inflorescence a simple or branched raceme, glabrous; flowers 1–4 at each node; pedicels 4–9 mm long, glabrous, articulated near or below the middle, green below and whitish above the articulation. Tepals spreading, subequal, 3-veined, white with greenish stripe on the outside, the inner ones $12\text{--}17 \times 4\text{--}6$ mm, the outer slightly narrower. Filaments fusiform, glabrous, 8–10 mm long; anthers 5–8 mm, slightly curved apically at anthesis. Style declinate, exserted. Capsule deeply 3-lobed, smooth, $9\text{--}14 \times 7\text{--}9$ mm, with the perianth persistent at the base. Seeds thin, flat, black, ca. 2.5–4 mm across.

Habitat and distribution The species is found in grassy slopes, thicket or evergreen forest, sometimes in ravines or near ditches, on more or less loamy, dark brown to reddish soils, between 1200 and 3000 m. This prominent and showy species is near-endemic in Ethiopia, occurring in the Bale and Harerge floristic regions. It is otherwise found in Eritrea. There is a slight intraspecific variation: The populations in Eritrea lack the ciliate leaves characterizing the more southern populations. Subspecific recognition might be justified. The main flowering period is September to November.



*Chlorophytum
nubicum*

5. *Chlorophytum nubicum* (Baker) Kativu

The species epithet refers to Nubia, which is the region along the Nile in northern Sudan and southern Egypt. In ancient times it was an independent kingdom. It was described by Baker in 1878 in the genus *Anthericum*, based on material collected in the Sudan. Kativu (1993) transferred it to the genus *Chlorophytum*, due to the traits of the complex inflorescence nodes. The species is unique within the flora area by producing flowers and fruits before the leaves develop.

Description Plants, loosely tufted, 10–40 cm high. Rhizome thick, moniliform, often carrying fibrous remains of old leaf bases. Roots spongy and thick. Leaves in a rosette, glabrous, up to 25×0.5 cm; margin minutely papillate to ciliate. Peduncle with small bractlike leaves along its entire length. Inflorescence unbranched. Pedicels, up to

10 mm long, articulate below the middle, 2–4 together at the lower nodes. Perianth star-shaped, white with dull pinkish stripes on the outside; tepals 7–15 mm long, 3 (–5) veined; both filaments and anthers 4–5 mm long. Capsule shallowly transversely ridged, rounded triangular in cross section. Seeds irregularly folded, *c* 2 mm in diameter.

Habitat and distribution

Growing in lava grassland or burnt areas in dry woodland, from 550 to 2300 m. The species is rare and found within the Illubabr and Sidamo floristic regions, otherwise widespread in tropical Africa west to Guinea and south to Mozambique and Zambia.



*Chlorophytum
somalienne*

6. *Chlorophytum somaliense* Baker

The species epithet is self-evident, the species was described on material collected in Somalia, by the German collector Hildebrandt. It was described by Baker in 1893. This name was not in use for about 100 years until Nordal and Thulin revised the genus on the Horn of Africa in 1993. Before then it was known by the name *C. tenuiflorum* Baker. It is easily distinguished from



Fig. 75. *Chlorophytum somaliense*, from Sidamo floristic region.

other *Chlorophytum* species in Ethiopia by its very thick tuberous roots and its delicate, irregular flowers.

Description

Plants 30–70 cm high. Rhizome short, moniliform; roots thick and spongy throughout, or narrow near the base enlarging into long, conspicuous tubers. Leaves rosulate, erect or sometimes falcate with clasping bases, glabrous, often bluish to greyish green, narrowly lanceolate to linear, $20\text{--}40 \times 0.5\text{--}3$ cm, margin undulate. Peduncle, erect, leafless, 15–40 cm. Inflorescence a simple, glabrous raceme with one flower at each node, supported by short floral bracts. Pedicels *c.* 10 mm at anthesis, elongating with age, articulated in upper half. Flowers conspicuous, zygomorphic; tepals, white with pale green midrib, 15–17 mm long, narrow, 3-veined, constricted and thus forming an urceolate structure around the ovary, outer parts reflexed at anthesis. Stamens exserted; filaments declinate up to 15 mm, anthers 2–3 mm long. Style declinate, exserted. Capsule with remnants of the perianth at the base, triquetrous, variable in size, but often large, 10–15 mm long and most often distinctly longer than wide. Seeds several, disc-shaped, 3–5 mm across.

Habitat and distribution

The species is found in more or less degraded *Acacia-Combretum-Commiphora* woodland to bushland, also on treeless grassland, on black cotton soil or red lateritic soils, but also in sand, limestone or gypseous rocks between 800 and 1650 m. It occurs in the Shewa, Gamo Gofa, Sidamo, Bale and Harerge floristic regions in Ethiopia, and is further widespread in Somalia and Kenya. The irregular (zygomorphic) flower morphology differs from most other *Chlorophytum* species and might indicate a different pollination syndrome. More observations are needed. The main flowering period is from March to June, flowers are also seen in October in the Gamo-Gofa floristic region.



*Chlorophytum
bifolium*

7. *Chlorophytum bifolium* Dammer

The species epithet '*bifolium*' means with two leaves, and as with '*tetraphyllum*', this character does not always hold. European botanists, like Dammer in 1905, described species on material from Southern Ethiopia, without overall knowledge of the variation in the nature. In fact, this species carries 2–5 basal leaves. The characteristic features of this species is the pubescent inflorescence and the one-flowered nodes.

Description

Small plants up to 15 cm high, from a very short rhizome; roots reduced to a fascicle of elongated tubers, 1.5–2 cm long.

Leaves 2–5, rosulate, lanceolate 8–14 × ca. 1.5 cm, acute, with hyaline margin. Peduncle slender, scabrid, leafless, 5–7 cm long. Inflorescence a simple raceme; rachis ± puberulous; bracts, narrow, membranaceous, up to 3 mm long. Flowers inconspicuous, one at each node (rarely 2 at the lower node); pedicels suberect, 3 mm long at anthesis, glabrous, articulated near to slightly above the middle. Tepals semi-patent, whitish, 6 mm long, 3-veined. Stamens shorter than the perianth. Capsule trigonous, indistinctly transversely ridged, 6–9 × 9–12 mm, emarginate, with withered remnants of the perianth at the base. Seeds flat to slightly folded, 2 mm across.

Habitat and distribution

The species is probably growing in shallow, poorly drained soils (whitish silt) on limestone. This information is from Somalia, there is no data on the ecology of the species in Ethiopia, where it is only known from the type locality 'between Marta and Djaro', supposedly in the Bale floristic region. It is also found in Somalia and NE Kenya. Main flowering time supposedly from April to May.



Chlorophytum pterocarpum

8. *Chlorophytum pterocarpum* Nordal & Thulin

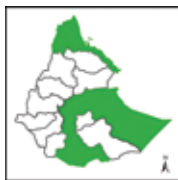
The species epithet '*pterocarpum*' refers to the fruits which has three wing-like compartments (*pteros* = wing in Greek). It is a small, inconspicuous species, described by Nordal and Thulin, as late as in 1993, based on material collected from Sof Omar in the Bale floristic region. It is distinct within the genus by its fruit shape.

Description

Small plants up to 10 cm high, from a very short rhizome; roots swollen, narrow in the proximal part, then expanding to a tuber-like structure 1.5–2.5 × 0.5 cm. Leaves 2–5, rosulate, lanceolate, 5–7 × c. 1.5 cm, often prostrate, with a finely undulate-crispate hyaline margin. Peduncle slender, glabrous, leafless, 3–5 cm long. Inflorescence a simple raceme, rachis glabrous; flowers, inconspicuous, 1 at each node; pedicels stiffly patent, 5–12 mm long at anthesis, articulated near the apex, c. 1 mm below the flower. Tepals semipatent, subequal, oblong, whitish, 6–8 mm long, 3-veined. Capsule deeply 3-lobed, with three flat wing-like compartments, slightly transversely ridged, 6–9 × 9–12 mm, emarginate, with withered remnants of the perianth at the base. Seeds thin, flat, black, c. 3–4 mm across.

Habitat and distribution

This small and inconspicuous plant is known from *Acacia-Commiphora* woodland/bushland on limestone between 1400 and 1500 m. It is a narrow endemic in the Bale floristic region. It has been collected in fruit in April and in October.



*Chlorophytum
inconspicuum*

9. *Chlorophytum inconspicuum* (Baker) Nordal

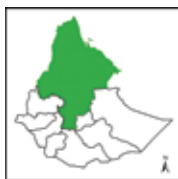
The species epithet refers to the inconspicuous habit of this small plant. It was described by Baker, who referred it to *Anthericum* in 1877 based on material from Somalia, later transferred to the genus *Chlorophytum* by Nordal in 1993. This species is recognised by its filiform leaves, its reduced peduncle, its prostrate inflorescence, and the relatively large capsules in comparison to the small plant size.

Description

Slender herb from a short rhizome, roots, thin in the proximal parts, swelling to an elongated tubers distally. Leaves filiform or narrowly linear, $10\text{--}25 \times 0.1\text{--}0.3$ cm, glabrous except for the sometimes scabrid margins; basal sheaths whitish to purplish. Peduncle reduced so that the lower flowers/fruits are found within the leaf rosette. Inflorescence a very lax, simple raceme $2\text{--}15$ cm long, prostrate. Flowers 1–2 per node; pedicels $2\text{--}5$ mm long, articulated near or below the middle, glabrous $\pm$ recurved. Tepals white, with an outside greenish stripe, $3\text{--}5$ mm long, 3-veined. Capsule triquetrous, $8\text{--}10 \times 5\text{--}6$ mm when ripe, with withered perianth at the base. Seeds deeply folded, c. 2 mm across.

Habitat and distribution

The species is found in woodland or degraded bushland, on shallow soils overlying volcanic rocks or limestone, between 750 and 1800 m, recorded from the Shewa, Sidamo, and Harerge floristic regions in Ethiopia and also in Eritrea. It is otherwise found in Somalia, Yemen, Oman and North Kenya. The main flowering period is from May to July.



*Chlorophytum
tuberosum*

10. *Chlorophytum tuberosum* (Roxb.) Baker

The species epithet refers to the roots that form large tubers. The species was described as an *Anthericum* by Roxburgh in 1800 based on material from India, and transferred to *Chlorophytum* by Baker in 1876. It is one of the species with high potential as an ornamental plant in the genus, due to the characteristic large, pure white flowers about 3 cm in diameter, larger than in any other *Chlorophytum* species.

Description

Plants $20\text{--}40$ cm high. Rhizome short irregular; roots swollen with robust distal tubers up to 7×1 cm. Leaves rosulate, glabrous, lanceolate, $10\text{--}40 \times 1\text{--}3$ cm. Peduncle, stout, $10\text{--}20$ cm long, leafless, glabrous, terete. Inflorescence unbranched, racemose, up to 15 cm long. Pedicels, 1–3 at each node, up to 10 mm long, articulated



Fig. 76. *Chlorophytum tuberosum*, from near Moyale, Sidamo floristic region.

near the middle. Flowers large and showy, sweet scented, shallowly bowl shaped, tepals $20 \times 6-9$ mm, the only species in the genus with more than 9-veined tepals. Capsule triquetrous, c. $15 \times 8-12$ mm, slightly emarginate. Seeds irregularly folded, ca. 2mm across.

Habitat and distribution

The species grows in woodland or shrubland, often in degraded *Combretum-Terminalia* vegetation on heavy black soils or more sandy soils, often in seasonally flooded areas and flood plains, between 550 and 1600 m. It is widespread in Ethiopia, found in in Tigray, Gonder, Gojam, Welo, Shewa, Illubabor, Kefa, Gamo-Gofa, and Sidamo floristic regions. It occurs in Eritrea and is further distributed in a wide belt from Nigeria east to Somalia and India and south to northern Tanzania. The main flowering period in Ethiopia is from April to August.



*Chlorophytum
zavattarii*

11. *Chlorophytum zavattarii* (*Cufodontis*) Nordal

The species epithet honours the collector who first found this plant, the Italian Zavattari, who collected it in Sidamo. Based on this collection Cufodontis described the species as *Anthericum* in 1939, but it was later transferred to *Chlorophytum* by Nordal in 1993. It is easily recognised by its extremely branched inflorescence



Fig. 77.
Chlorophytum
zavattarii, from
Sof Omar, Bale
floristic region.

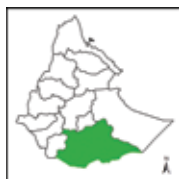
and its long, stiff, patent pedicels.

Description

Plants 30–60 cm. Rhizome short; roots swollen and thick throughout their length. Leaves rosulate, broadly lanceolate, more or less rounded apex, $10-20 \times 2.5-5$ cm, often with a hyaline margin. Peduncle 10–25 cm, leafless, but sometimes with one sterile bract below the inflorescence. Inflorescence a much branched panicle. Pedicels stiffly patent to semipatent, 1–3 at each node, up to 25 mm long, articulated near the apex. Tepals patent, 5–6 mm, white with greenish dorsal stripe, 3-veined. Fruits not seen.

Habitat and distribution

The species grows in open woodland or bushland dominated by *Acacia-Commiphora* and/or *Combretum* woodland, often in degraded and grazed areas, on red soils or on rocky limestone, between 1400 and 1700 m, occurring in the Sidamo and Bale floristic regions. It also occurs in Somalia and Northern Kenya. The main flowering period is two-peaked, May and October to November. Fruiting specimens need to be collected, as we have no information on the fruits and the seeds of this species.



*Chlorophytum
humifusum*

12. *Chlorophytum humifusum* Cufodontis

The species epithet '*humifusum*' means 'spreading on the ground' (cfr. *humus* = organic mould), and refers to the prostrate inflorescences which characterize this species. It was described by Cufodontis in 1939, based on plants he had collected in the Sidamo floristic region. Among the *Chlorophytum* species with prostrate inflorescences, it can be recognised by the distichous leaf arrangement, i.e. the leaves are organised in two ranks.

Description

Small plants, rarely more than 12 cm, from a moniliform rhizome; roots wiry, shortly branched, bearing small tubers (up to 1×0.5 cm) mainly on the lateral root branches. Leaves more or less distichous, glabrous, narrowly lanceolate, petiolate, up to 12×1 cm, peduncle only up to 1 cm long. Inflorescence, up to 15 cm long, lying flat on ground, simple or with one basal branch, lax, elongated internodes, rachis scabrid; floral bracts up to 4 mm, sometimes ciliate. Flowers 1 (–2) at each node. Pedicels 6–8 mm at anthesis, elongating slightly in fruit, articulation in lower half. Perianth open, white, tepals 5–7 mm long, 3-veined. Capsule c. 4×4 mm, seeds not known.

Habitat and distribution

The species grows in shallow stony soils in *Acacia-Commiphora* bushland or woodland between 1000 and 1300 m, in the Sidamo and Bale floristic regions. Otherwise it is only known from adjacent parts of Kenya.



Fig. 78.
*Chlorophytum
humifusum*,
cultivated plant
originally from
near Negelle,
Sidamo floristic
region.

The main flowering period is from May to June, but flowers have also been collected in November.



*Chlorophytum
herrmanni*

13. *Chlorophytum herrmanni* Nordal & Sebsebe

The species epithet honours Christof Herrmann, who has recently collected several interesting plants in the western parts of the Wellega floristic region, and was described by Nordal & Sebsebe (2005). The species was accordingly not included in the Flora of Ethiopia and Eritrea. It belongs among the species with prostrate inflorescence, but differs from the others by its very branched inflorescence and pubescent leaf undersides.

Description

Short horizontal rhizomes with fleshy roots. Leaves rosulate, petiolate, lanceolate, up to 20×3.5 cm; acute with hyaline, crisply undulate margin, ciliate on margin and the veins on the abaxial part of the leaf. Peduncle 2–2.5 cm long prostrate, with short hairs. Inflorescence conspicuously branched, 4–12 cm long, also flat on the ground. Bracts large and leaf-like, up to 15×5 mm, ciliate on margin and veins. Flowers 2–4 at each node. Pedicels not curved, 5–6 mm at anthesis, articulated in lower half. Flowers white with brownish tips, tepals $5-6 \times 2$ mm long with 3–5 veins. Stamens shorter than the tepals, filaments 3–4 mm, anthers 2 mm. Styles straight, ca. 5 mm. Fruits and seeds not known.

Habitat and distribution

The plants grow on open rocky outcrops in the bamboo forest, at 1590 m. It is so far only known from the Assosa area in the Wellega floristic region, and is accordingly a narrow endemic in Ethiopia. The main flowering period is in June.



*Chlorophytum
gallabatense*

14. *Chlorophytum gallabatense* Schweinf. ex Baker

The species epithet refers to the Gallabat area between Ethiopia and the Sudan, where it was collected by Schweinfurth and later published by Baker in 1876. It is recognised by its very undulate leaves, its branched inflorescence and small greenish to yellowish flowers.

Description

Plants 15–60 (–75) cm high. Rhizome horizontal, short, moniliform. Roots fairly narrow, shortly branched, bearing tubers ($2-3 \times 1.5$ cm) mainly on the lateral branches. Leaves rosulate, (3–) 5–8 to a stem, glabrous, lanceolate, broadest at the middle, narrowed and

Fig. 79.
Chlorophytum
gallabatense,
from near
Yabello, Sidamo
floristic region.



clasping below, occasionally petiolate, $10\text{--}75 \times 2\text{--}4$ cm, the margins glabrous or minutely scabrid, undulate; peduncle glabrous, leafless, occasionally with a single sterile bract below the inflorescence, up to 20 cm long. Inflorescence paniculate; branches most often with short internodes, more elongated in shadow-forms, rachis glabrous to scabrid. Pedicels scabrid, 2–4 at a node, articulated near or above the middle, 3–10 mm long. Perianth with reflexed tepals, yellowish to greenish, 5–7 mm long, 3-veined. Capsule emarginate, triquetrous, $3\text{--}5 \times 5\text{--}7$ mm, smooth. Seeds disc- to saucer-shaped, 2.5 mm in diameter.

Habitat and distribution

The species is commonly found in more or less degraded and heavily grazed woodland dominated by *Acacia*, *Combretum*, *Commiphora* and/or *Terminalia*, between 700 and 2100 m. It is found in the Tigray, Shewa, Wellega, Gamo Gofa, Sidamo, Bale and Harerge floristic regions in Ethiopia and also in Eritrea. It is otherwise widespread in Africa west to Senegal and south to Zimbabwe. The main flowering period is from April to June; in the southern provinces it has a second period also in October to November.



Chlorophytum
micranthum

15. *Chlorophytum micranthum* Baker

The species epithet *micranthum* is of Greek origin and means small-flowered (*anthos* = flower). It was described by Baker in 1878, based on a Schweinfurth collection from the Sudan. It is closely related to *Chlorophytum*

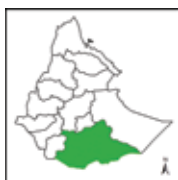
gallabatense (see above) and might only deserve subspecific rank. It is separated from *C. gallabatense* by its leaves developing after the flowering and its somewhat smaller flowers.

Description

Plants with leaves appearing after flowering, up to about 20 cm high. Rhizome short, carrying fibrous remains from previous year's leaves. Roots fairly narrow with tubers on lateral branches. Leaves in a basal rosette, glabrous, narrowly lanceolate, never collected when fully developed. Peduncle leafless, up to 10 cm long. Inflorescence simple to branched; floral bracts small. Pedicels, 2–4 at a node, up to 20 mm long, articulate near the middle. Tepals slightly recurved, pale green, 4–5 mm long, 3-veined. Capsules 3-lobed, c. 4 mm long. Seeds not known.

Habitat and distribution

The species is so far only recorded from the Illubabor floristic region (flowering in April), but is otherwise found in the Sudan and in Kenya. The relation to *Chlorophytum gallabatense* needs to be further studies.



*Chlorophytum
pendulum*

16. *Chlorophytum pendulum* Nordal & Thulin

The species epithet refers to the pendant fruits. It was described in 1993 by Nordal & Thulin based on material collected in the Bale floristic region. It has small inconspicuous flowers, and is most easily recognised by its hanging, pyramide-shaped fruits. The distinctly ciliate leaves may provide an additional clue to its identity.

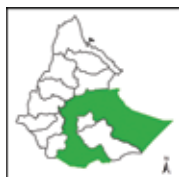
Description

Slender, tufted plants 15–40 cm tall, from a short, sometimes moniliform rhizome; roots thin and wiry with tubers, 1–2 × 0.5–1 cm. Leaves several, rosulate, green to olive green, linear 20–45 × 0.4–0.9 cm, erect but drooping in upper parts, margin distinctly ciliate, with a distinct midrib; cataphylls more or less membranaceous, sometimes with a characteristic white/green striping. Peduncle slender, lax, glabrous, leafless, 5–30 cm long. Inflorescence a simple raceme, rachis glabrous to slightly papillose, often drooping margin; flowers 1–4 at each node; pedicels, very thin, glabrous, 5–12 mm long at anthesis, articulated near the base. Tepals patent, white, with greenish to brownish stripes on the outside, 5–9 mm long, 3-veined. Capsule pendent, deeply 3-lobed, slightly transversely ridged, 10–15 × 6–10 mm, triangular in longitudinal section, broadest in the distal end, emarginate, with remnants of the perianth at the base. Seeds thin, flat, black, 3–4 mm across.

Habitat and distribution

The species is found in woodland dominated by *Acacia*, *Combretum*, and *Commiphora*, in more or less shade, on dark or red stony soils, sometimes on limestone, between

1000 and 1650 m. It is known from the Bale and Sidamo floristic regions in Ethiopia, and it is otherwise only known from adjacent areas in Kenya. The main flowering period is April, but it probably has a second period also in October.



*Chlorophytum
subpetiolatum*

17. *Chlorophytum subpetiolatum* (Baker) Kativu

The species epithet refers to the leaves that are slightly petiolate, a trait that is not very common in the genus. It was described in the genus *Anthericum* by Baker in 1876, based on plants from Mozambique, and transferred to *Chlorophytum* by Kativu in 1993. The species is among the few that have potential as an ornamental in the genus, due to its relatively large (about 2.5 cm in diameter) pure white star-like flowers in dense inflorescences. It is further recognised by having distichous leaves (more or less in two ranks) and by the roots that are fusiform, i.e. swollen at the middle, and tapering to each end like a spindle, lacking tubers otherwise common in the genus.

Description

Plants 10–30 cm. Rhizome moniliform; roots spongy, fusiform, swollen at the base, tapering towards the tips. Leaves subdistichous



Fig. 80.
*Chlorophytum
subpetiolatum*,
from near
Assosa, Wellega
floristic region.

to distichous, 1–7 to a stem, more or less firm, sometimes distinctly ribbed, petiolate, linear-lanceolate to lanceolate, glabrous, $5\text{--}30 \times 0.5\text{--}2$ cm, outer ones wider, curved and cataphyll-like. Peduncles often glabrous below and pubescent in the upper half, 5–25 cm long. Pedicels 1–2 at each node, articulated below the middle, up to 6 mm long in fruit. Flowers white, starlike, tepals 7–15 mm long, 3–5-veined, sometimes streaked brown or green on the outside. Anthers longer than the filaments, often curled on drying. Style slightly declinate, exserted. Capsule shallowly three-lobed, smooth, 5–7 mm long, slightly emarginate. Seeds irregularly folded, *c.* 1.5 mm across.

Habitat and distribution

The species is found in overgrazed grassland and degraded woodland, on blackish, brownish to reddish more or less barren soils, between 1200 and 2000 m. It has been recorded from Shewa, Sidamo, and Harerge regions, and is otherwise widely distributed in tropical Africa west to Nigeria and south to Angola, Zimbabwe and Mozambique. It is a variable species constituting a polyploid complex. The main flowering period is in April to May.



Chlorophytum affine

18. *Chlorophytum affine* Baker

The species epithet '*affine*' means neighbouring or related to, and might refer to the fact that the plants often grows in clumps due to efficient vegetative reproduction by its branched underground rhizome. It was described by Baker in 1875 based on plants from Tanzania. This species was referred to as *Chlorophytum tordense* Chiov. in the Flora of Ethiopia and Eritrea (1997). When the genus was revised for the Flora of Tropical East Africa, it was found that the two taxa were conspecific, and as *C. affine* is the oldest name, it has priority. The species is characterised by its leaves that have a particular cross-banded, pattern of white and green, not seen in other species. The species is often divided in two varieties, the Ethiopian material belongs to var. *curviscapum* (Poelln.) Hanid, the epithet referring to the peduncle, which is curved near the base.

Description

Slender, tufted plants about 25 cm tall, from a distinctly moniliform rhizome; roots thin and wiry with tubers, 1×0.5 cm. Leaves grass-like, distichous, erect or falcate, linear, canaliculate, $15\text{--}20 \times 0.4\text{--}0.8$ cm, sheathing below, margin and midrib distinctly ciliate. short cataphylls, ciliate at margin and veins, with a characteristic cross-banded pattern of white and green. Peduncle slender, arcuate below,

stiffly erect above the arcuation, scabrid to pubescent, leafless, 10–15 cm long. Inflorescence a simple raceme, rachis scabrid, often sinuate ('zigzag'). Flowers single at each node; pedicels stiffly erect, up to 7 mm long, articulated near the base. Tepals patent, white with greenish brown stripe on the outside, 8–9 mm long, 3-veined. Capsule erect, triquetrous, slightly transversely ridged, c. 5×7 mm, emarginate, with remnants of the perianth at the base. Seeds thin, folded, ca. 3 mm across.

Habitat and distribution

It grows in *Acacia-Commiphora* bushland or wooded grassland, on shallow soils often overlying limestone between 950 and 1450 m. It is recorded from the Sidamo and Bale floristic regions in Ethiopia, but is otherwise widespread in tropical Africa from Senegal in west to Zambia in south. The main flowering period is from October to November.



*Chlorophytum
cameronii*

19. *Chlorophytum cameronii* (Baker) Kativu

The species epithet honours the collector of the type material, Cameron, who was the first to collect the plant, in Tanzania. It was described by Baker in the genus *Anthericum* in 1876, and later transferred to *Chlorophytum* by Kativu in 1993. This is an elegant lily with large showy flowers, up to 3 cm in diameter, which are white inside and pinkish outside. It is further characterized by the 'zigzag' inflorescence and winged peduncle.

Description

Plants tufted, 40–70 cm high. Rhizome short, knobby, horizontal, moniliform; roots thin, wiry, bearing distinct distant tubers. Leaves subdistichous to distichous, linear to linear lanceolate, sheathing below, glabrous, $30\text{--}70 \times 0.6\text{--}0.9$ cm; midribs prominent. Cataphylls and outer leaf bases with reddish brown spots or stripes. Peduncle flat, narrowly winged, glabrous, up to 40 cm long. Inflorescence unbranched, up to 16 cm long; rachis sinuate ('zigzag'), winged below, terete above, glabrous. Pedicels 1–4 at each node, articulated below the middle, up to 8 mm long in fruit. Tepals 10–15 mm long, (3–)5–7 veined, whitish, outer ones pinkish on the outside. Stamens slightly shorter than the perianth, arranged in two groups, 4 in the upper and 2 in the lower; filaments glabrous, as long as the anthers. Style declinate, slightly exserted. Capsule obovoid, trigonous, transversely ridged, up to 7 mm long. Seeds irregularly folded, ca. 1 mm in diameter.

Habitat and distribution

This species grows in *Combretum-Terminalia* woodland with tall grasses on sandy soils, between 500 and 600 m. It is rather rare in Ethiopia, only found a few places in the

Wellega and Illubabor floristic regions in Ethiopia, but is otherwise widespread through eastern Africa south to Zambia and Malawi. The main flowering period is May to June.



*Chlorophytum
pseudocaulle*

20. *Chlorophytum pseudocaulle* Tesfaye & Nordal

The species belong in a group (of which the widespread *C. andongense* and *C. viridescens* also occur in East Africa) characterized by fleshy roots, peduncles with $\pm$ bractlike leaves (“bracteate peduncles”) and a branched inflorescence. Within this group it is only one species where the leaf bases enclose each other to make a so-called false stem (= *pseudocaulis*), the justification for the species epithet. It was recently collected by Tesfaye Awas in the Welega floristic regions and described by Tesfaye & Nordal (2007).

Description

Herbs up to 105 cm. Rhizome short with thick spongy roots without tubers. Pseudostem, created by folded leaf bases up to 40 cm, surrounded by short cataphylls. Leaves, inner up to 40×5 –6.5 cm, with spaced veins and a distinct midrib. Peduncle with 1–2 bractlike leaves 10 – 13×1 –1.5 cm below the inflorescence. Inflorescence, a branched panicle with 2–3 flowers per node. Pedicels up to 10 mm with joint below the middle, pale brown above the articulation, green below. Flowers urceolate, pale brown, tepals 6×1 –1.5 mm, reflexed, 3-veined; filaments filiformous, scabrid, 3–5 mm long; anthers 0.7 mm curved; style exerted slightly bent. Capsules 5×5 mm, trigonous in cross section. Seeds slightly saucer shaped, 2 mm in diameter.

Habitat and distribution

The species is only known from wetland, open bushy meadows dominated by *Kotchya*, *Cyperus*, *Cymbopogon*, *Hyparrhenia*, within bamboo tickets (*Oxytenanthera abyssinica*) on grey clay, otherwise dominated by other geophytes, in the Welega floristic region in Ethiopia from 1430 to 1560 m. It is thus a narrow endemic, flowering in April to May.



*Chlorophytum
comosum*

21. *Chlorophytum comosum* (Thunberg) Jacques

The species epithet ‘*comosum*’ means ‘bearing a tuft of leaves’ and refers to the trait that small plantlets often develop in the nodes of the inflorescence. It was described

by Thunberg in 1794 in the genus *Anthericum*, based on South African material, and transferred to *Chlorophytum* by Jacquin in 1862.

Description

Rhizome vertical, short. Roots spongy, long, often with spindle-shaped tubers. Leaves lax, rosulate, petiolate, lanceolate, most often glabrous, sometimes with scabrid margin, $15\text{--}60 \times 1\text{--}5$ cm. Peduncles 1–4 to a plant, lax, more or less arcuate, glabrous. Inflorescence elongated to 75 cm, lax, open, paniculate or simple; rachis sometimes scabrid; bracts 5–20 mm, acute to acuminate. Pedicels articulated near or above the middle, (1–) 2–4 at each node, 4–10 mm long. Perianth, whitish to greenish, tepals patent to slightly reflexed at anthesis, 4–7 mm long, 3-veined. Stamens exserted; filaments scabrid, dilated above the middle, longer than the anthers. Capsule triquetrous, emarginate, often broader than long, 3–6 mm. long, 4–8 mm wide. Seeds saucer-shaped, slightly folded, c. 2–3 mm across. Often producing small plantlets from the bracts of the inflorescence, pseudovivipary.

Habitat and distribution

The species occurs as undergrowth in rain forest and riverine forest on brown to black loamy clay, also on crevices in rocks along streams, sometimes epiphytic, between 1050 and 1900 m from the Illubabor and Kefa floristic regions in Ethiopia. It is otherwise found throughout Tropical Africa south to the Cape. It is a variable species which sometimes has forms with more dense and erect inflorescence, thus resembling *C. macrophyllum*. The taxonomy of these intermediate forms should be further investigated. The non-viviparous form has usually been called *C. sparsiflorum*. The Ethiopian populations seem to mix viviparous and non-viviparous forms more or less randomly and taxonomic separation is not justified. Forms of *C. comosum* are common and widespread as ornamentals, sometimes with variegated (yellowish/greenish striped) leaves. Recent molecular analyses might indicate that the Southern African plants (to which the name *comosum* is attached) do not group with the Ethiopian plants, in that case the latter will probably have to be described as a new species. More studies are necessary.



*Chlorophytum
serpens*

22. *Chlorophytum serpens* Sebsebe & Nordal

The species epithet '*serpens*' means creeping in Latin (cf. snake = serpent), referring to the trailing habit of the inflorescence, which is rooting at the nodes. The species is closely related to the widespread heterogenous species

complex, *C. comosum*. It differs by having one-flowered nodes (vs. usually 2–4-flowered) and by its shorter and distinctly ciliate leaves. The ecology is also different, *C. comosum* grows in forests and riverine vegetation, whereas *C. serpens* grows in woodland, influenced by regular fires. It was discovered in 2001 by Sebsebe and collaborators, and was described by Sebsebe & Nordal (2005).

Description Rhizome extremely short. Roots short, ending in distinct tubers. Leaves rosulate, petiolate, broadly lanceolate with ciliate margins. $7\text{--}10 \times 2\text{--}3$ cm. Peduncles lax, arcuate, glabrous. Inflorescence elongate, up to 50 cm long, simple or with one branch; bracts 5–15 mm, acute to acuminate. Pedicels, single at the nodes, articulated near or below the middle, 4–8 mm long. Perianth white, tepals patent, 3–5 mm long, 3-veined. Stamens shorter than the tepals. Capsules not known. Always producing small plantlets from the bracts of the inflorescence, pseudovivipary.

Habitat and distribution The species grows in *Combretum-Terminalia* woodland around 1100 m, and is only known from one locality in the Gojam floristic region, about 70 km from Chagni towards Guba. It flowers in July. More information is needed.



Chlorophytum macrophyllum

23. *Chlorophytum macrophyllum* (A. Richard) Ascherson

The species epithet '*macrophyllum*' refers to the wide leaves of this species. It was described by Richard as *Anthericum* in 1850, based on plants from Tigray. Ascherson transferred it to *Chlorophytum* in 1867. The species is among the largest and most robust *Chlorophytum* species, with a very dense inflorescence. If it had not been for the fact that the white flowers soon turn brownish, the plant might have potential as an ornamental.

Description Plants, often in clumps, 30–90 cm high. Rhizome short, compact; roots thick, spongy with spindle-shaped elongated tubers up to 6 cm long. Leaves rosulate, petiolate, broadly lanceolate, glabrous, with undulate or crisped margins, $15\text{--}90 \times 3\text{--}7$ cm. Peduncle leafless (or with a few sterile bracts connected to the inflorescence), stout, erect, glabrous up to 50 cm long. Inflorescence up to 30 cm, dense, unbranched, or sometimes with 1–2 branches in lower part; rachis slightly scabrid; floral bracts 10–25 mm, drying off blackish. Pedicels fascicled, up to 9 at a node, articulated in the middle or upper half, 8–13 mm long. Perianth white; patent, but slightly urceolate around

the lower part of the ovary, then patent, 3–5-veined, 9–15 mm long. Stamens as long as the perianth; filaments fusiform, scabrid, shorter than the anthers; style slightly declinate. Capsule trigonous, 5–12 mm long, most often slightly longer than wide, blackish when dehiscent. Seeds saucer-shaped, ca. 2.5 mm in diameter.

Habitat and distribution

The species occurs in forest and along streams, also in woodland and open bushland, on black soils, between 1500 and 2000 m. It occurs in the Tigray, Wellega, Illubabor, Kefa and Sidamo floristic regions in Ethiopia and in Eritrea. It is otherwise widespread in tropical Africa west to Sierra Leone and south to Mozambique and Zimbabwe. The main flowering period is from April to July (in southern Ethiopia also in October to November).



*Chlorophytum
filipendulum*

24. *Chlorophytum filipendulum* Baker

The species epithet means hanging (*pendulum*) by a thread (*filum*), and probably refers to the swollen parts of the tuberous roots connected by narrower more threadlike parts. It was described by Baker in 1878 based on material collected by Welwitsch in Angola. It is related to another robust species, *C. macrophyllum*, from which it differs by its petiolate leaves, its shorter pedicels and tepals, and that it turns blackish on drying.

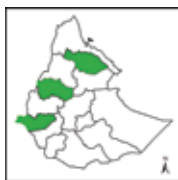
Description

Plants up to 70 cm high, immediately becoming blackish when cut or when drying. Rhizome elongated with medium thick roots expanding distally to elongated tubers, 1–3 cm long. Leaves in a rosette, with petioles 10–20 cm long, lamina broadly lanceolate, glabrous, 12–50 × 5–10 cm, attenuate at the base. Peduncle leafless (or with a few sterile bracts just below the inflorescence) stout, up to 50 cm long. Inflorescence 10–20 cm long, lax, usually unbranched, sometimes with 1–2 branches in lower part; rachis scabrid; lower bracts 1.5–16 cm, ordinary flower bracts 1–2.5 cm, enveloping buds and pedicels. Pedicels, 3–4 at each node, articulated in upper third, whitish above the articulation, 6–8 mm long. Perianth whitish, sometimes green-tipped, turning brownish immediately after anthesis, slightly urceolate; tepals 5–7 × 1.5–2.5 mm, 3-veined. Stamens slightly shorter than to as long as the tepals; filaments 3–5 mm long, fusiform, scabrid; anther 1.5–2.5 mm. Style slightly declinate. Capsule triquetrous in cross-section, emarginate (5–) 7–13 mm long, distinctly longer than wide. Seeds saucer-shaped, 1.5–2 mm across.

Habitat and distribution

The species belongs in the Guineo-Congolese rain forests, and is within the flora area only found in the transitional

forest areas of the Kefa floristic region. *C. filipendulum* was recorded in Ethiopia after the publication of the Flora of Ethiopia and Eritrea (1997).



*Chlorophytum
blepharophyllum*

25. *Chlorophytum blepharophyllum* Schweinf. ex Baker

'*Blepharo*' in Greek means eye-lashes, and it refers to the ciliate leaves, characteristic of the species. The species was collected by Schweinfurth in the Sudan, and published by Baker in 1876. In addition to the ciliate leaves and prominent basal short leaves ('cataphylls'), the species is characterised by its brown tinged inconspicuous flowers, and that the plants dry blackish (the two latter traits shared with *C. filipendulum*).

Description

Plants very variable, 10–40 cm high. Rhizome small with fibrous remains of old leaf bases. Roots spongy, with elongate tubers near the tips. Leaves rosulate, olive green above, paler below, lanceolate, moderately firm, clasping the peduncle; lamina 10–30 × 1.5–4 cm long, margins ciliate; cataphylls orange to purplish or with coloured veins, with ciliate and often crisped margins. Peduncle leafless, smooth, shorter than the leaves. Inflorescence most often unbranched, occasionally with a few short branches at the base; floral bracts linear to lanceolate, lower ones up to 25 mm long, often shortly ciliate and hairy. Pedicels articulated near or above the middle, up to 10 mm long in fruit, 2–4 from the same node. Perianth whitish tinged brown, slightly urceolate near the base, tepals 6–8 mm long, 3–5-veined, scabrid on margins and veins, patent except for the base. Capsule obovoid, emarginate, triquetrous, 6–10 mm long, most often longer than broad, with persistent perianth remnants at the base. Seeds disc-shaped, 2–3 mm in diameter.

Habitat and distribution

The species grows in open deciduous *Combretum* woodland and in grassland margins, often on light sandy and stony soils between 550 and 1200 m. It is recorded from the western parts of Tigray, Gojam, and Illubabor floristic regions in Ethiopia. It is widespread in tropical Africa west to Senegal, through Central and East Africa, south to Angola, Zimbabwe and Mozambique. The plants have only been collected in the fruiting stage, from July to October. The plants from Illubabor floristic region seem to have more pendent fruits than typical for the species elsewhere. More material is needed to see whether this form deserves taxonomic recognition.

AMARYLLIDACEAE

The family includes bulbous plants (rarely rhizomatous), with leaves in a basal rosette. The scapes are leafless, carrying an umbel-like inflorescence, subtended by two or more bracts, which are free or partly fused. The flowers are showy with 3+3 tepals forming a distinct tube with free segments. The 3+3 stamens are fixed in the opening of the tube. The ovary is inferior. These flower traits are shared with another Ethiopian family, Hypoxidaceae. However, the families differ in that Hypoxidaceae includes more or less pubescent plants, while Amaryllidaceae includes glabrous plants (except for occasional ciliate hairs along the leaf margin). Furthermore, species of Hypoxidaceae have a racemose rather than an umbel-like inflorescence. The Ethiopian representatives of Hypoxidaceae are always yellow-flowered, while those of indigenous Amaryllidaceae are red/pink, white, or a combination of both.

Distribution and classification

Amaryllidaceae is mainly a tropical to subtropical family, including *c.* 65 genera. It has a notable centre of diversity in southern Africa, which houses 19 genera. Four genera are indigenous in Ethiopia and Eritrea: *Scadoxus*, *Crinum*, *Ammocharis*, and *Pancratium*. Another centre of diversity is southern America, and several of the ornamentals, also cultivated in Africa, are recruited from there, viz. *Hippeastrum* and *Zephyranthes*. Only one genus, *Crinum*, occurs naturally both in the Old and the New World Tropics.

Reproduction

The ovaries are divided in three chambers separated by walls that contain nectar-producing tissue (septal nectaries). The nectar is excreted from small pores at the top of the ovary into the tubes, which are from 1 cm (as in *Scadoxus*) to 15 cm (as in *Crinum*) long. Pollinating insects with appropriate length of the probosces, butterflies for the shorter tubes and hawk-moths for the longer, may reach the nectar. When sucking the nectar, the insects will transfer pollen between plants. Most often the

anthers open before the stigma is mature ('protandry'), thus avoiding self-pollination.

Chemistry and use

The family is known for its ornamental species. In addition to occasional indigenous species, some introduced species may be found in gardens, particularly of the two South American genera, *Hippeastrum* (sometimes called 'Amaryllis', not to be confused with the real Cape *Amaryllis*) and *Zephyranthes*. Species of the Eur-Asiatic genus *Narcissus* are also sometimes cultivated in the cooler parts of Ethiopia and in Eritrea. The cultivated genera are included in the key, but not treated further in the text.

Almost all representatives of the family have proved to be poisonous as different alkaloids frequently occur in all parts of the plants. This trait is connected to the life history strategies of plants growing in an environment with strong seasonality. Due to the bulbs, efficient storage organs for water and nutrition, the amaryllids are able to sprout very early in the rainy season, and they flower and disperse the seeds before grasses and forbs become dominant. Such plants are vulnerable to the grazing animals which for several months do not have enough fresh leaves to consume. Without their chemical protection the amaryllids might have had little chance to survive.

Key to the genera

1. Plants rhizomatous, or if bulbous with an elongated rhizomatous part under the bulbous part; leaves thin with petioles sheathing to form a 'false stem'; involucre bracts 4 or more; fruit a berry 1. *Scadoxus*
 - Plants bulbous; leaves without a petiole; involucre bracts 1–2; fruit a loculicidal capsule (meaning that it splits between the walls that subdivide it), sometimes slightly fleshy with irregular opening 2
2. Flowers red, pink or whitish tinged pink, zygomorphic or regular, without a cylindrical corona 3
 - Flowers white or yellow, regular, with a cylindrical corona, either formed by the fused filament bases or as a ring from the perianth outside the stamens 6
3. Scape solid; perianth tube cylindrical, most often longer than the free tepals; seeds greenish and fleshy 4
 - Scape hollow; perianth tube funnel shaped, shorter than the free tepals; seeds black and flat (cultivated plants only) 5

4. Leaves in a basal rosette; flowers whitish with pink to red bands, or tinged pinkish, most often irregular (zygomorphic) with curved tube and free tepals (5 mm or broader) connivent to form a funnel or bell; more rarely with straight tube and radial symmetrical arrangement of the recurved segments **2. Crinum**
 - Leaves arranged in two prostrate fans; flowers pinkish, regular with straight tube and free recurved tepals (narrower than 5 mm) **3. Ammocharis**
 5. Large plants (more than 30 cm tall), with several flowers in the inflorescence, scales present in the throat of the perianth tube (cultivated) **Hippeastrum**
 - Slender plants (less than 30 cm), one-flowered, without scales in the throat of the perianth tube (cultivated) **Zephyranthes**
 6. Flowers whitish, with a distinct cylindrical perianth tube; filaments fused below, forming a corona, rarely reduced to short teeth **4. Pancratium**
 - Flowers yellowish (at least the corona), with a short $\pm$ funnel-shaped perianth tube; corona forming a ring outside the stamen. (cultivated) **Narcissus**
-

1. SCADOXUS Raf.

This genus has been joined with the genus *Haemanthus* in earlier literature (also in horticulture). *Haemanthus*, as now understood, is a strictly South African genus with perennial, fleshy, distichous leaves, lacking petioles. At the moment, 6 species are recognised within the genus *Scadoxus*, of which three occur in Ethiopia (in horticulture they may still be referred to *Haemanthus*). The representatives of the genus are usually found in different forms of savannah woodland (as *Scadoxus multiflorus* and *S. puniceus*), but a few have evolved adaptations to rain forest conditions, which is rather rare among bulbous plants (e.g. the Ethiopian endemic, *S. nutans*).

The underground organ is in principle a bulb, but the rhizomatous part, to which the bulb scales are attached, is more elongated than in ordinary bulbs. The leaves are annual, dying back every growing season, and they are distinctly petiolate, forming a false stem that is mottled or spotted. The blades (lamina) are thin-textured with a distinct midrib. The several (4 or more) involucre bracts, free or fused, are most often membranaceous and drooping, but sometimes persistent and sub-erect. The flowers are distinctly pedicellate, red, in dense many-

flowered umbels, with narrow short tubes. The segments are spreading or more or less erect. The filaments are red, carrying small, yellow, dorsifixed anthers. The straight style ends in a minute stigma. The fruits are ovoid to globose, berries, brightly red to orange, with 1–3 relatively large, pale and fleshy seeds.

Reproduction The red flower heads are conspicuous and attractive to butterflies with a proboscis longer than 1 cm. The red colour of the berries suggests bird dispersal. Exact data on pollination and dispersal are, however, lacking. The berries are probably poisonous to man, as they contain alkaloids.

Conservation Of the three species, *Scadoxus nutans* is the only endemic, growing in rain forests threatened by habitat destruction. Habitat destruction is thus the major threat to the existence of this species, and protection is needed. The two other species, *S. multiflorus* and *S. puniceus*, are widespread (but local races in Ethiopia of both species might represent endemic genotypes, accordingly deserving special attention, see below).

The species of the genus (often called ‘fireball lilies’) are spectacular and may be of horticultural interest. *S. multiflorus* is easily cultivated.

Key to the species

1. Underground organ rhizomatous; inflorescence nodding, berries subglobose
1. *S. nutans*
 - Underground organ with a distinct bulb, although the rhizomatous part might be elongated; inflorescence erect; berries globose
2
 2. Inflorescence a semi-globose to globose umbel; involucre bracts membranaceous, most often colourless and early drooping; free tepals spreading during anthesis
2. *S. multiflorus*
 - Inflorescence a conical umbel; involucre bracts herbaceous, persistent, suberect to erect, green, sometimes spotted or tinged purplish; free tepals erect to suberect during anthesis
3. *S. puniceus*
-

*Scadoxus nutans*

1. *Scadoxus nutans* (Friis & I. Bjørnstad) Friis & Nordal

The species epithet '*nutans*' refers to the nodding flower heads, a trait by which this species is easily recognised. In spite of its showy appearance, it was not described until 1971 by Friis and Bjørnstad (then in the genus *Haemanthus*), based on material from the Kefa Floristic region. Five years later it was transferred to the genus *Scadoxus* by Friis and Nordal.

Description

Herb, 30–50 (–100) cm high. Leaves forming a distinct false stem, 25–40 cm, through which the inflorescence and new shoots pierce, leaf blade up to 40×8 cm. Inflorescence bracts short and partly fused, supporting the dense nodding inflorescence of 20–30 flowers. Pedicels up to 1 cm. Tepals red to scarlet with a tube of 8 mm, segments ascending about 20×2 mm. Fruit-stand ultimately erect with ovoid berries about 15 mm long.



Fig. 81.
Scadoxus
nutans, from
near Bonga, Kefa
floristic region.

Habitat and distribution

The species is native to moist afro-montane; it is growing on the forest floor or on tree trunks up to 10 m above the ground (epiphytic), forming dense mats on trunks and branches. So far it is only recorded from the Kefa and Illubabor floristic regions, from 1000 to 2300 m. It is a narrow endemic, not known outside this area. The flowering period is from November to February. The species must be regarded as threatened, particularly since the forests in which it occurs are being heavily exploited.

Notes

The nodding inflorescence indicates pollinators arriving from below rather than from above. This trait is shared with another rainforest species, *S. cyrtanthiflorus* (C.H. Wright) Friis & Nordal, from the Ruwensori mountains in Uganda. Possibly, protection of flowers from heavy rains gives the evolutionary background for this trait. The phenomenon should be further studied. When the seeds are mature, the infructescence turns upwards and displays bright scarlet berries for animal (probably bird) dispersal.



Scadoxus multiflorus

2. *Scadoxus multiflorus* (Martyn) Rafinesque

The specific epithet '*multiflorus*' means many-flowered, and refers to the rich-flowered heads. The species is recognised by its globose inflorescence with up to 150 flowers. It was described by the son of Linnaeus ('L.f.') in 1781, but first validly published by Martyn as *Haemanthus multiflorus* in 1795. Rafinesque transferred it to his new genus *Scadoxus* in 1838.

Description

Herb, up to 70 cm high. Leaves, produced at the same time or after the flowering, form a distinct false stem, 10–40 cm, lateral to the scape, leaf blade up to 40 × 7 cm. Inflorescence with membranous bracts, sometimes partly fused, withering early, subtending the globose inflorescence of 10 to 150 flowers. Pedicels 1–3 cm. Tepals orange red to scarlet with a tube of 5–15 mm, segments spreading 12–25 × 1–2 mm. Berries globose, 0.5–1 cm in diameter.

Habitat and distribution

The species is found in savannah woodlands and in riverine and montane forests. It seems to prefer some shade, and is growing on dark brown to blackish soils, from 1000 to 3000 m. It is found in almost all floristic regions within Ethiopia and Eritrea, except in the lowlands, and is widespread elsewhere in Tropical Africa west to Senegal,



Fig. 82.
Scadoxus
multiflorus,
from Sidamo
floristic region.

east to Arabia and south to Natal. The main flowering period in Ethiopia is from January to April (in the Kefa floristic region flowering plants have been observed also in November). It is probably pollinated by butterflies and dispersed by birds.

Notes This variable and widely distributed species has been subdivided into 3 subspecies. All the Ethiopian and Eritrean material belongs to subsp. *multiflorus*. There is, however, a common form in Ethiopia, differing from forms elsewhere, by its partly fused involucral bracts and its elongated, almost stolon-like, rhizomateous part under the bulb. This form has been described as *S. bivalvis* Beck, and further studies should be undertaken to see whether this form deserves taxonomic recognition on the specific or subspecific level. It is possible that the two forms meet in Ethiopia, but since underground organs are rarely included in herbarium material, and the bract are often too withered to judge the degree of fusing. More field observations are needed to settle this problem.

*Scadoxus puniceus*

3. *Scadoxus puniceus* (L.) Friis & Nordal

The specific epithet '*puniceus*' refers to the coloration of the bracts, so-called 'phoenician purple', which is the common colour of the involucral bracts of the plants in South Africa, from where the species originally was described by Linnaeus (1753), then as a species in the genus *Haemanthus*. Friis and Nordal transferred it to the genus *Scadoxus* in 1976. The Ethiopian forms, however, often have greenish bracts, not fitting the species' name. *S. puniceus* differs from *S. multiflorus* by having persistent, more or less erect involucral bracts, thereby forcing the individual flowers together into a subglobose to conical, rather than a globose, inflorescence. The tepals are more or less erect in the former and spreading in the latter.

Description

Herb up to c. 80 cm. Leaves produced at the same time or before the flowers, producing a false stem, 30–50 cm long. Leaves very similar to *S. multiflorus*. Scape 30–75 cm. Involucral bracts herbaceous, greenish or green tinged, persistent and more or less erect at anthesis, forming a cup-like structure. Inflorescence conical, 30–100-flowered. Pedicels 0.5–2.5 cm long. Flowers as in *S. multiflorus* except that the segments are more or less erect at anthesis. Berries as in *S. multiflorus*.



Fig. 83.
Scadoxus puniceus, from Wellega floristic region.

Habitat and distribution This species is found in deciduous woodlands and grasslands on heavy black clay soils, often on basalt, between 1400 and 2600 m; recorded from Gonder, Shewa, Kefa, Arsi, Sidamo, and Harerge floristic regions. The species has a very disjunct distribution in southern and eastern Africa. The flowering period in Ethiopia is from March to June.

Notes *Scadoxus puniceus* might be difficult to distinguish from *S. multiflorus* in younger stages, when the involucre bracts are erect in both. There seems to be heterogeneity as to colour of bracts and flowers in *S. puniceus*. The Ethiopian plants appear to have more greenish bracts than the more southern populations, and Cufodontis referred to them as a separate species, *Haemanthus fax-imperi*. It has been shown that the populations with strongly coloured involucre tend to have more greenish single flowers, whereas those with more inconspicuously, i.e. greenish, coloured involucre tend to have more reddish coloured flowers. If the Ethiopian populations turn out to be fairly homogeneous in these traits, taxonomic recognition at the subspecific level might be justified. Field notes and photos are encouraged.

The compact inflorescence of *Scadoxus puniceus* appears more or less like a single composite flower. This entity might attract other pollinators than those of *S. multiflorus*.

2. CRINUM L.

Species belonging to this genus are robust with large bulbs, enabling them to sprout with the first rains. They have large and showy flowers. The leaves are found in basal rosettes, they are strap-shaped or lanceolate, with or without a thickened midrib. The inflorescence, subtended by two free involucre bracts, consists of 2 to 40 flowers, rarely only one. The flowers are sessile or with pedicels up to 4 cm long; with a narrow cylindrical, curved or straight tube up to 13 cm long, and with free tepal segments that are whitish, with or without a red to pink dorsal line. In most species the tepal segments are connivent to a bell or a funnel, except in *C. bambusetum*, where the segments are spreading and reflexed. The filaments are most often declinate (i.e. assembled in a fas-

cicle below the style), rarely spreading and arcuate. The fruits are in principle capsules, with a membranaceous or fleshy fruit wall (pericarp), bursting irregularly or rotting rather than bursting, with several large greyish or greenish, subglobose to irregularly compressed seeds, 5–10 mm in diameter.

Crinum is a large pantropical genus, including some 100 species, of which *c.* 50 are represented in Africa, and four in Ethiopia. The genus is widespread in the tropics, and particularly the group of species with straight tubes and spreading tepal segments are found all around the tropics, in the New as well as the Old World Tropics. The species with curved tubes and segments forming a funnel or bell are restricted to the Old World Tropics, and they have their main distribution in Africa. The centre of variation of the genus is in southern Africa, and the number of species is decreasing from the south to the north. The number of endemic species also decreases towards the north, but still two of the four Ethiopian species are endemic or near-endemic.

The most common species found in cultivation in Ethiopia appears to be a South African cultivar, *C.* × *powelli*, which differs from the other species by having a distinct false stem, and pinkish flowers without distinct bands on the tepals.

Reproduction The flowers produce large amounts of nectar from the septal glands in the ovary, excreted into the bottom of the deep narrow tube. The flowers tend to smell most intensive in the evening, and they are certainly pollinated by large hawk-moths with a proboscis more than 12 cm long. The two different flower morphs found in the genus (bell-shaped vs. star-shaped) might be attributed to different pollinators, but observations are lacking.

When the fruits are mature, the scape tends to bend, placing the fruits on the ground. This is not a particularly efficient seed dispersal mechanism, seeds being located in small heaps close to the mother plant. The seeds in this genus are only covered by a thin membrane, lacking the protective seed coat of most other lilies. This is due to the fact that the integuments of the ovules never develop. Accordingly, the seeds are not able to survive a dry season, and have to germinate in the same rainy season as they are produced, sometimes even starting to germinate within the fruit. The large seeds contain much endosperm, and within a relatively short period they can

produce small bulbs with contractile roots that drag them into the soil. As subterranean small plants, rather than seeds, they are able to survive the next dry season. In mature plants most leaves are withering during the dry season, the plant rapidly developing new leaves from the base with the first rains. Flowers and fruits are then developed during a fairly short time (facilitated by the storage of water and nutrition in the large bulbs).

Conservation The genus has a great horticultural potential, and both native and exotic species are grown as ornamentals. The only near-endemic species, *Crinum abyssinicum*, is widespread in Ethiopia and north Somalia, and probably not threatened. For *C. bambusetum*, with few populations in Ethiopia and unknown status in the Sudan, care should be taken.

Key to the species

1. Inflorescence with 20–40 flowers, pedicels more than 2.5 cm long; flowers star-shaped, with straight tube and reflexed free tepals 1. *C. bambusetum*
 - Inflorescences with less than 15 flowers, flowers sessile to shortly pedicellate, with curved tube and free tepals connivent, to form bells or funnels 2
 2. Cultivated plants with a distinct false stem, constituted by the sheathing leaf bases C. × powellii
 - Plants from the wild without a distinct false stem 3
 3. Leaves without a distinct midrib, undulate with scabrid margin, only few young leaves with intact apices; 7–14 flowers, subsessile or pedicels up to 2 cm, inflorescence subtended by early withering and drooping bracts 2. *C. macowanii*
 - Leaves with a distinct midrib, not undulate, without scabrid margin, not undulate, most leaves with intact apices, flowers 2–7 (–9), sessile, subtended by more or less erect involucre bracts 4
 4. Leaves green, not glaucous; tepals with a sharply bordered broad dark reddish band, visible on both sides of the segment 3. *C. ornatum*
 - Leaves glaucous; tepals pure white or slightly pink flushed outside in apical parts, pure white on the inside 4. *C. abyssinicum*
-

*Crinum bambusetum*

1. *Crinum bambusetum* Nordal & Sebsebe

The specific epithet '*bambusetum*' refers to the fact that this species is the only *Crinum* which grows in bamboo thickets. It was recently (in 2002) discovered and described. It belongs to a group of species with radially symmetrical flowers and reflexed tepals ('*Stenaster*'). Only one representative of this group is found on the Horn of Africa.

Description

Leaves without a distinct midrib, lacking intact apices. Scape up to 60 cm. Involucral bracts papery and early drooping. Flowers 12–40, distinctly pedicellate, pedicels up to 4 cm long. Buds nodding before anthesis. Perianth tube straight, at anthesis up to 13 mm long, tepals narrowly lanceolate, reflexed, whitish, tinged pink on the outside, about 6 to 10 cm long; filaments reddish, arcuate, anthers c. 7 mm; style pink. Fruits not known.

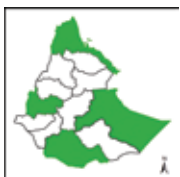
Habitat and distribution

This species is found in openings in bamboo thickets (*Oxytenanthera abyssinica*) around 1500 m, and it is only known from a few populations near Assosa in the Wellega floristic region. The closest relative is *Crinum subcernuum* Baker from southern Africa. The main flowering period is from May to June. Recent molecular



Fig. 84. *Crinum bambusetum*, from west of Assosa, Wellega floristic region.

analyses have shown that the radial symmetrical *Crinum* species (i.e. '*Stenaster*') in Africa have two plant geographical connections: to America and to Asia, *C. bambusetum* connects towards the east, i.e. to the Asiatic taxa.



Crinum macowanii

2. *Crinum macowanii* Baker

The specific epithet refers to MacOwan, a South African plant collector in the 19th century. It was described by Baker in 1878. It belongs to the group of *Crinums* with connivent, rather than recurved tepals, thus forming a bell ('*Codonocrinum*'), rather than a star ('*Stenaster*'). The species is recognised by its glaucous undulate leaves, lacking entire apices (due to the fact that all leaves wither down in the dry season and grow from the base in the rainy season). It is the only Ethiopian species in '*Codonocrinum*' that has pedicellate (stalked) flowers.

Description

Leaves glaucous, broadly lanceolate, 10–60 × 6–10 cm at anthesis, more or less prostrate, without a distinct midrib, and most leaves lacking intact apices. Scape 10–30 cm. Involucral bracts papery, and early drooping. Buds erect. Flowers 7–14, subsessile to pedicellate, up to 2 cm, perianth tube curved, 8–12 cm, free part of tepals white with a faint pink dorsal band, not sharply bordered, broadly lanceolate, 8–11 × 2–3 cm, forming a bell. Filaments white, declinate; anthers dark, c. 10 mm; style white, tinged pink distally. Fruits green, fading to dull yellow, with a thin pericarp closely enveloping the 20–60 seeds, giving an irregular undulate surface, often by the remains of the perianth tube. Seeds greenish, covered with a silvery grey water repellent membrane making them very smooth, variable in shape and size, but often flattened.

Habitat and distribution

The species is found in grassland and open *Acacia* bushland, often on heavily grazed and degraded land, on heavy blackish to reddish soils, from 1000 to 2600 m. It is recorded from the Wellega, Arsi, Gamo-Gofa, Sidamo and Harerge floristic regions, and also from Eritrea. This is one of the most widespread *Crinum* species in Africa, distributed from South Africa to Ethiopia. The flowering period in Ethiopia is from April to June.

Fig. 85. *Crinum ornatum*, from Uganda, grown in Oslo, Norway.



Crinum ornatum

3. *Crinum ornatum* (Aiton) Bury

The specific epithet '*ornatum*' means adorned and decorative, being the stem of the word 'ornamentals', plants that are cultivated for their beauty. It was the first *Crinum* discovered in Africa, and was described by Aiton already in 1789, based on material from West Africa. Linnaeus (1753) knew this species from West Africa, but he regarded it as conspecific with *Amaryllis zeylanicum* from Ceylon/Sri Lanka. Like *Crinum macowanii*, it belongs in the group of *Crinums* with tepals forming a bell (*i.e.* '*Codonocrinum*'). It is recognised by its non-glaucous leaves with more or less entire apices and distinct midribs, the erect involucre bracts, and by the strong red bands of the perianth segments, visible from both sides of the otherwise pure white flowers.

Description

Leaves not glaucous, patent to semi-erect, narrowly lanceolate, most often with intact apices, $30 \times 2.5\text{--}6$ cm, with distinct midrib. Scape 20–50 cm, contemporary with the leaves. Involucral bracts stout, erect, persistent until after anthesis, greenish tinged red. Flowers sessile, 3–7 (–9), tube curved, 8–10 cm, free parts of tepals, white, with a broad, sharply bordered, dark red, crimson or violet band, visible on both sides, broadly lanceolate, $8\text{--}10 \times c. 2$ cm, forming a bell. Filaments white tinged red, declinate shorter than the tepals; anthers, 8–10 mm; style tinged red distally. Fruits greenish tinged red, with a thick pericarp, subglobose without or with a very short apical beak. Seeds light green, closely stacked and irregularly compressed, 15–45 per fruit.

Habitat and distribution

It is found in wooded grassland, woodland or open forests, sometimes in abandoned cultivated fields, often

along rivers or in swampy depressions, on red sandy or dark brown loamy soils, between 650 and 2000 m. It is recorded from the Tigray, Shewa, Kefa, Arsi, Bale, Gojam, Illubabor and Harerge floristic regions, with its northernmost limit in Eritrea. This species is otherwise widespread in a transition zone between forest and savannah in Tropical Africa, west to Senegal and south to Namibia. The flowering period in Ethiopia is from April to June, except in Kefa where it appears to flower in February.

Notes This taxon was regarded as conspecific with *C. zeylanicum* (L.) L. by Nordal (1982) in the Flora of Tropical East Africa (like Linnaeus 230 years earlier). The two taxa are morphologically similar, but recent investigations, including molecular data, have suggested that the African *C. ornatum* and the Asiatic *C. zeylanicum*, although closely related, should be kept as two different species.



Crinum abyssinicum

4. *Crinum abyssinicum* Hochst. ex A. Rich.

The specific epithet refers to the Latin name for Ethiopia, 'Abyssinia', where the species was discovered by Hochstetter, and later described by A. Richard in 1850. This species is the most common Ethiopian *Crinum*. Its closest relative is *C. ornatum*, differing by its glaucous leaves and the completely white or faintly pink-tinged tepals.

Description Leaves glaucous to greyish green, erect, linear to narrowly lanceolate, mostly with intact apices and distinct midrib, $40 \times 1-3.5$ (-5) cm. Scape 40-80 cm. Involucral bracts erect for a while, papery. Flowers



Fig. 86. *Crinum abyssinicum*, from near Dinshu, Bale floristic region.

2–6, sessile (rarely subsessile). Flowers pure white or sometimes tinged pink, only rarely with a pink dorsal line; tube curved (3–) 6–10 cm, free part of tepals broadly lanceolate, 8–10 × c. 2 cm, forming a bell; filaments white, declinate 4–6 cm, anthers 6–10 mm; style white, as long as the tepals. Fruits greenish, sometimes tinged red, with a thick fleshy pericarp, subglobose without an apical beak. Seeds not seen.

Habitat and distribution

This species grows typically in waterlogged valley grasslands and swampy depressions or along stream banks, sometimes in fallow fields, on black clayish and loamy soils, from 1650 to 3100 m. It has been recorded from most floristic regions in Ethiopia and also in Eritrea, but is not known outside the Horn of Africa. The flowering period is from April to July (August).

Notes

The species was earlier referred *Crinum schimperi*, the name *C. abyssinicum* then being restricted to a form with a short flower tube. It has been shown that this difference might be due to the young developmental stage of the type specimen of *C. abyssinicum*. There is no reason for splitting.

3. AMMOCHARIS Herb.

This genus is closely related to *Crinum*. The only real difference is in the leaf arrangement, which is biflabellate in *Ammocharis*, i.e. the leaves are organised in two opposite, prostrate fans. The flowers are radially symmetrical with long narrow tubes, and reflexed free tepals, like in *Crinum bambusetum*. There are three species in the genus, all African, only one of which is recorded in Ethiopia.



Ammocharis tinneana

***Ammocharis tinneana* (Kotschy & Peyr.) Milne-Redh. & Schweick.**

This species is named after the plant collector Tinné, who collected plants in the Sudan. It was described in the genus *Crinum* by Kotschy and Peyritsch in 1867, and transferred to the closely related genus *Ammocharis* by Milne-Redhead and Schweickert in 1939.



Fig. 87. *Ammocharis tinneana*, (left) flowering plant form near Mega; (right) rosettes from near Negelle, both Sidamo floristic region.

Description Bulb up to 12 cm in diameter, with a distinct neck. Leaves spreading on the ground in two opposite fans, 1–3 cm broad, sometimes with ciliate margins, length varying with age, appearing before or after the flowers. Scapes 5–25 cm, prostrate. Inflorescence with 10–30 flowers. Pedicels 1–4 cm long. Flowers pale pink with darker mid-ribs, fading to crimson or magenta with age, sweetly scented; tube 6–10 cm long; segments 4–8 $\times$ 0.3–0.5 cm, spirally recurved towards the apex at anthesis. Stamens arcuate, pink, 3–6 cm long, anthers 4–9 mm. Fruit reddish, subglobose, 2–2.5 cm in diameter.

Habitat and distribution This species grows in open *Acacia-Commiphora* bushland, on more or less bare, reddish to brownish soils, tolerating heavy grazing and also erosion, from 1000 to 1800 m in the Bale and Sidamo floristic regions. It is widespread from Namibia and Botswana in the south to Ethiopia in the north. Few flowering specimens have been collected from Ethiopia, but indicating that the species may have a two-peaked flowering period, around April and around October, probably flowering before the rains.

4. PANCRACTIUM L.

This genus is easily recognised by its whitish, more or less long-tubed flowers with a cylinder-like corona of fused filaments, which, however, in one of the Ethiopian species is reduced to double teeth between the stamens. The inflorescences consist of one to few flowers, subtended by two more or less fused bracts. The flowers are radially symmetrical, with free, linear and spreading

tepal segments. The bases of the filaments are fused to a cylindrical corona in *P. tenuifolium*, and reduced to short teeth in *P. centrale*. The fruit is a dry loculicidal capsule including several black angular seeds in each chamber.

There are about 20 species in Africa, the Mediterranean region and southern Asia, four species occur in tropical Africa, and two are found in Ethiopia, *Pancratium tenuifolium* and *P. centrale*. Another *Pancratium* species is cultivated in the upland Eritrea. It is a robust plant with up to five flowers, and may belong to the Mediterranean *P. maritimum* L.

Reproduction The white flowers, fragrant in the evening, indicate hawk-moth pollination. The dry erect capsules, opening by slits from the top, procure a mechanism for ballistic seed dispersal.

Conservation *Pancratium tenuifolium* is widespread in the drier parts of the African savannah grasslands and should not need particular protection, although it is not really common in Ethiopia. The narrow endemic *P. centrale* needs particular attention.

Key to the species

1. Leaves pubescent at the base, scape shorter than 10 cm; flowers sessile, perianth tube longer than 8 cm, corona longer than 2 cm, filament length 1–2 cm **1. *P. tenuifolium***
- Leaves glabrous, scape longer than 15 cm; flowers with pedicel 1–2.5 cm long, perianth tube 1.5–2 cm, corona reduced to 12 teeth, 5 mm long, filament length 0.2 cm **2. *P. centrale***



*Pancratium
tenuifolium*

1. *Pancratium tenuifolium* A.Rich.

The specific epithet '*tenuifolium*' refers to the narrow leaves (*tenuis* = slender, *folium* = leaf). Richard described the species in 1850, based on material from Ethiopia. It is closely related to the West African *P. trianthum* (meaning three-flowered), which reaches the Sudan, but it is so far not known from Ethiopia.

Description Leaves 30–40 × 0.3–1 cm, finely pubescent near the base. Scape, 1–10 cm long, slightly to finely pubescent. Inflorescence one-



Fig. 88.
Pancratium
tenuifolium,
from Wellega
floristic region.

flowered, enclosed in a pale membranaceous, bifid involucre. Flowers sessile. Perianth tube 9–12 cm, slender, pale green; free tepal segments 5–10 cm long, up to 1 cm broad, white or cream with greenish median stripe; corona 2–4 cm with 2 triangular lobes between each pair of stamens. Filaments 1–2 cm long, anthers 5–8 mm. Capsule subglobose to cylindrical, up to 2.5 cm long, with up to 30 seeds. Seeds black, glossy, subglobose to angular, c. 4 mm in diameter.

Habitat and distribution

This species is found in open woodland, thorn scrub or sparsely vegetated grassland, on sandy or clay soils, from 550 to 1800 m. It is recorded from the Tigray, Gonder, Shewa, Afar, Wellega, Illubabor and Harerge floristic regions in Ethiopia and also in Eritrea. This species is otherwise widely distributed in drier parts of the Sudano-Zambesian savannah area, from Senegal in the west to Namibia and Botswana in the south. The flowering period in Ethiopia is from March to May.

Notes One collection of a species with broader and twisted leaves made on sand dunes of lowland Eritrea, might be conspecific with *P. tortuosum*, otherwise distributed in Arabia and Egypt. More studies are needed.



Pancratium centrale

2. *Pancratium centrale* (A. Chev.) Traub

The species epithet '*centrale*' refers to Central Africa, where A. Chevalier collected a few cultivated specimens in 1903 (areas now belonging to Chad). He described it in the new genus *Mizonia*, which is now a synonym of *Pancratium*. The species is very distinct within the genus *Pancratium*, due to the short perianth tube and the reduced corona of 12 short teeth.



Fig. 89.
Pancratium centrale, from near Assosa, Wellega floristic region.

Description Leaves, 30–50 × 1–3.5 cm, glabrous. Scape 18–20 cm long, glabrous; inflorescence (1–)2–3-flowered, subtended by a membranaceous entire bract, sometimes with an apical split. Pedicels 1–2.5 cm long. Perianth tube 1–2 cm long; free tepal segments 3–5.5 cm long, 0.5–0.8 cm wide, pure white, spreading; corona reduced to 12 triangular teeth, i.e. two teeth between each of the 6 stamens, each tooth up to 5 mm long. Filaments *c.* 2 mm long, about 1 cm long, style slightly overtopping the anthers at anthesis. Capsules 3.5–4 cm long and 1.2 cm wide, carrying the persistent perianth tube at the apex. Seeds black, several, globose, 4–5 mm in diameter.

Habitat and distribution It grows in open *Combretum-Terminalia* bushland at 1370 m, and is so far only known from the wild near Assosa in Wellega. It has otherwise been collected a few times in Chad (in cultivation), Cameroon and the Central African Republic. The flowering period in Ethiopia is from May to June.

Notes The species has, as indicated above, a very short perianth tube compared to the other species in the genus. This might indicate that the pollinators are smaller hawk-moths with a relatively short proboscis. The rarity of the species indicates that it is vulnerable.

HYACINTHACEAE

The family includes bulbous plants with leaves, often more or less spotted, filiform to lanceolate, in a basal rosette. The scape is glabrous and leafless. The inflorescence is usually a raceme or a spike, rarely extremely branched (as in *Schizobasis*). The flowers are white to greenish, yellowish, or purplish, often with a darker green or purple midrib. The tepals are free or fused into a shorter or longer tube. The ovaries include one to many ovules per locule. The fruit is most often a loculicidal capsule, that means it splits between the walls separating its three chambers, rarely it is septicidal, i.e. it splits along the separating walls. The seeds are black, subglobose or flattened, sometimes winged.

Distribution and classification

Hyacinthaceae is related to the Alliaceae (the onion family), differing mainly in chemistry and inflorescence, which is umbel-like in the latter. The sulphur compounds giving the particular smell and taste of members of the onion family are lacking in the hyacinths. Amaryllidaceae is also related, sharing the features of a typical bulb, the basal leaf rosette and the glabrous scape, differing in the umbel-like inflorescence similar to the onions; and further by the inferior ovary.

The family is widely distributed in tropical to temperate areas world-wide. Its centres of diversity are in Southern Africa and in the Mediterranean area. Taxonomists today disagree on the generic delimitation; from 40 to 67 genera are recently reported. On species number the agreement is better, and *c.* 900 species are accepted. On the Horn of Africa there are 7 genera: *Schizobasis*, *Dipcadi*, *Drimiopsis*, *Ledebouria*, *Drimia*, *Albuca*, and *Ornithogalum*. All these genera have centres of variation in southern Africa. *Dipcadi*, *Drimia*, and *Ornithogalum* reach the Mediterranean region and Central Asia. The species from the Horn of Africa find their closest relatives in the south.

Reproduction

Pollen and nectar are offered as floral rewards. The nectar is produced in the septal walls of the ovary, and secreted

in the bottom of the flower. Colour and scent are the chief floral attractions. One of the genera, *Drimiopsis*, has more or less closed flowers, but produce both nectar and smell, and they are probably pollinated by robust insects that manage to force their probosces into the flowers to reach the nectar.

Most species have upright scapes and capsules oriented upwards, with apical splits. These are typical traits of ballistic dispersal, which means that the seeds are thrown out of the capsule by heavy wind or pushes by animals. Some species, however, have lax scapes and place the seeds on the ground, not dispersed or to be further dispersed by smaller animals like ants.

Chemistry and use The family includes several taxa with cardio-active steroids (bufodienolids in *Drimia* and cardenolids in *Ornithogalum*). The family includes several ornamentals of commercial value, as the hyacinths. None of the Ethiopian species have so far been used in horticulture, but a few might have a potential.

Conservation Of the 21 Ethiopian species, three are endemic (*Drimia exigua*, *Drimia simensis*, and *Ledebouria urceolata*) and two are near-endemic (*Drimiopsis spicata* and *Ledebouria somaliensis*), indicating a total (near-) endemism of about 25%. The mentioned taxa should be surveyed and possibly protected.

Key to the genera

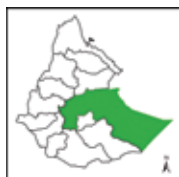
1. Inflorescence much branched; leaves lacking or strongly reduced **1. Schizobasis**
- Inflorescence a spike or a raceme, not branched, basal leaves present (but may be developed after the flowering) **2**
2. Inner tepals forming a distinct tube, outer tepals usually with a tail-like appendage **2. Dipcadi**
- Inner tepals not forming a distinct tube, outer tepals lacking a tail-like appendage **3**
3. Bracts absent; flowers globose to shortly cylindrical, tepals up to 6 mm long, at least the inner ones connivent covering the stamens and the ovary; ovary with 2 ovules per locus **3. Drimiopsis**
- Bracts present; flowers most often stellate, that is with tepals spreading, if connivent (as in *Albuca*) then tepals at least 8 mm long; ovary with 2 to several ovules per locus **4**

-
- | | | |
|--|------------------------|---|
| 4. Filaments usually purple; ovaries with 2 (rarely one) ovules per locus; seeds subglobose | 4. Ledebouria | |
| - Filaments whitish or greenish; ovaries with several ovules per locus; seeds flattened | | 5 |
| 5. Bracts with a spur; tepals usually fused at the base, seeds winged | 5. Drimia | |
| - Bracts without a spur; tepals always free, seeds not winged | | 6 |
| 6. Tepals yellowish to greenish, inner tepals connivent, outer $\pm$ spreading, base of the filaments clasping the ovary | 6. Albuca | |
| - Tepals white, with or without a green midrib, all spreading, filaments not clasping the ovary | 7. Ornithogalum | |
-

1. SCHIZOBASIS *Baker*

The leaves, all disappearing early in the growing season, are filiform with expanded leaf bases, which through the seasons build the bulb. The plants are otherwise made up of a fairly short peduncle and an extremely branched green inflorescence, which plays the major role in photosynthesis. The bracts are lanceolate and carry a spur (pocket-like extension) at the base. The tepals are free, broadly lanceolate, whitish, meeting at the apices and loosening from the base when withered, forming a cap on the developing capsule. The capsules are ellipsoid with black, flattened seeds.

The genus includes 5 species distributed from South to Eastern Africa. The genus has a close relative in *Bowiea*, sharing the traits of reduced leaves and extremely branched inflorescences that have taken over photosynthesis. The latter is much larger, up to 3 m, and climbing. This genus has its northern limit in Northern Uganda, and might also occur in SW Ethiopia even if it is so far not recorded.



Schizobasis intricata

Schizobasis intricata (Baker) Baker

The species epithet refers to the 'intricate' extremely branched inflorescence. The species was described in the genus *Anthericum* by Baker in 1872; two years later he transferred it to a new genus, *Schizobasis*. The type is from South Africa.

Description Plants up to 25 cm. Bulb up to 3 cm in diameter, leaves not present at anthesis. More than 200 flowers in the branched inflorescence. Bracts *c.* 1 mm, spurs up to 2 mm long. Pedicels *c.* 10 mm long. Tepals *c.* 3 mm long. Capsule ellipsoid, about 4 mm long. Seeds black, flattened, up to 2mm long.

Habitat and distribution The species is found on steep shaded rocky areas in degraded bushland/low woodland between 1400 and 1900 m, at a few sites in the Shewa and Harerge floristic regions. It has an extremely disjunct distribution in Africa: Tanzania, Zimbabwe, Zambia, Mozambique, Namibia, and South Africa. The flowering period in Ethiopia has not been traced.

2. *DIPCADI Medicus*

This genus includes relatively slender plants with small bulbs. The leaves are filiform to lanceolate. The inflorescence is a raceme with recurved pedicels when flowering, turning upwards in the fruiting stage. The flowers are yellowish green to green brown. The tepals are fused from $\frac{1}{4}$ to $\frac{1}{2}$ of their length forming a tube. The outer tepals are spreading from near the middle and most often they carry shorter and longer tails ('caudate appendages'). The filaments are flattened, inserted at the mouth of the tube. The ovary and capsule are sessile or on a short stalk ('stipitate'). The seeds are numerous, flattened and black.

The genus includes about 30 species distributed in Africa, in the Mediterranean region east to Central Asia, India and Sri Lanka.

Key to the species

1. Leaves filiform to lanceolate, glabrous; outer tepals with longer or shorter tails
1. *D. viride*
 - Leaves filiform, with hairs; outer tepals without a tail
2. *D. marlothii*
-

*Dipcadi viride*

1. *Dipcadi viride* (L.) Moench

The species epithet '*viride*', meaning green, refers to the colour of the flowers. It was described by Linnaeus as early as 1762, by him referred to the genus *Hycacinthus*, on the basis of material from the Cape in South Africa. Moench transferred it to *Dipcadi* in 1802. The appendages on the outer tepals are characteristic for this heterogeneous species complex.

Description

Plants 20–60 cm long. Leaves, 1–15, very variable in length and width, up to 80 cm long and 2 cm broad, filiform, linear to broadly lanceolate, smooth, margin sometimes undulate. Raceme with 5–40 flowers. Pedicels 2–8 mm, up to 11 mm in fruit. Bracts 6–17 mm. Flowers yellowish green to brownish green. Tepals 8–13 mm, outer with up to 30 mm long caudate appendages. Capsule 6–14 mm long, 6–15 mm in diameter. Seeds 4–7 mm long.

Habitat and distribution

This species is found in grassland, bushland or woodland, in sandy, stony, sometimes blackish soils, from 450 to 3200 m. It is widespread in Ethiopia and Eritrea. It has otherwise a wide distribution in tropical and southern Africa. The main flowering period in Ethiopia is from February to June.

Notes

The species is heterogeneous and more detailed field studies might justify more taxa on the subspecific – or even – the specific level. The variation is particularly pronounced in leaf width and tepal tail length, cf. the two plants presented in the Figure, representing one short-tailed and one long-tailed version. In fact, five species were described from Ethiopia, here all are referred to *D. viride* in the wide sense: *D. tacazzeanum* from Tigray, *D. minimum* and *D. rupicola* from Gonder, *D. erlangeri* from Bale, and the generic wrongly placed *Albuca hyacinthoides* from Sidamo. With information from the

Fig. 90. *Dipcadi viride*, (left) flowers with long appendages on the tepals, form Shewa floristic region; (right) flowers with short appendages on the tepals, from Tanzania.



herbarium specimens, it has been difficult to find any discontinuity in single characters and correlation in variation among characters, the species have thus been 'lumped' to a single species.

The adaptive role of tepal appendages is not known. One might guess that it is related to features of the pollinator. The plants excrete nectar, as all Hyacinthaceae, and might attract insects by smell; as to visual attraction they are not very impressive, at least not with human eyes.



Dipcadi marlothii

2. *Dipcadi marlothii* Engler

The species epithet is honouring Mr. Marloth, who collected the first plants representing this species in Botswana. It was described by Engler in 1889. The species is easily distinguished from *D. viride* by its hairy leaves and tepals without appendages.

Description

Small plants about 15 cm tall. Bulb c. 1.5 cm in diameter. Leaves filiform, pubescent. Raceme few-flowered. Bracts c. 6 mm, pedicels c. 3 mm. Tepals up to 15 mm, the outer ones lacking the caudate appendages otherwise common in the genus. Capsules and seeds not known.

Habitat and distribution

This species grows in bushland on red soils around 830 m, only collected once in the Harerge floristic region. It has an extremely disjunct distribution in Kenya, Zimbabwe, Botswana, Namibia and South Africa. On a regional scale, more analyses are necessary to find out whether the Southern African plants really represent the same species as the Ethiopian (and Kenyan?) ones. The flowering period in Ethiopia is in November.

3. *DRIMIOPSIS* Lindl. & Paxt.

This genus includes plants that often have spotted leaves that are narrowly to broadly lanceolate. The inflorescence is (sub)-spicate and different from all other genera in the family in that the flowers are not supported by bracts. The flowers are globular to shortly cylindrical, and the three inner do not open, except for a small apical hole where insects with a strong proboscis may gain access to the

nectar. The tepals are united at the base, green to white, sometimes blue (in *D. spicata*), often persistent in fruit. The filaments are flattened and triangular. The ovaries are sessile with 1–2 basal ovules per locule; style as long as the ovary, slender with a minute stigma. The capsules are subglobose, usually with 1–2 seeds, which are globose to ovoid with a folded, black shiny surface. The scape is more or less prostrate in the fruit stage, and ant dispersal might be suspected.

The genus includes about 15 species in Africa south of the Sahara, and reaches its northern limit in Ethiopia. In South Africa there is a group of species with petiolate leaves and basic chromosome number, $n=10$; in tropical Africa there is a group of species with sessile leaves and $n=11$. The Ethiopian taxa belong to the latter group.

Key to the species

1. Leaves narrowly lanceolate; flowers blue, both outer and inner tepals connivent at anthesis 1. *D. spicata*
- Leaves broadly lanceolate; flowers white, outer tepals spreading, inner ones conniven 2. *D. botryoides*



Drimiopsis spicata

1. *Drimiopsis spicata* (Baker) Sebsebe & Stedje

The species epithet refers to the spicate inflorescence, which is not typical for the genus *Scilla*, in which Baker described it in 1878, based on material from the Sudan. It was transferred to the genus *Drimiopsis* by Sebsebe and Stedje in 2005. It is easily recognised from all other species in the genus *Drimiopsis* by its blue flowers; all other species have whitish to green flowers. In the Flora of Ethiopia and Eritrea, *Drimiopsis spicata* was referred to *D. barteri*, which is among the green-flowered ones. The species appears to bridge the two genera, *Ledebouria* (which shares the flower colour) and *Drimiopsis* (which shares the reduced bracts, the closed flower and the sessile ovary). It might have originated as an inter-generic hybrid which has overcome sterility, and formed a distinct species.

Description

Plants 15–22 cm long. Leaves narrowly lanceolate, ca 17×2 cm. Inflorescence a dense spike. Flowers on very short pedicels. Tepals purplish to bluish, 2–2.5 mm long, connivent in upper parts, closing



Fig. 91. *Drimiopsis spicata*, cultivated in Addis Ababa, original specimen from Wellega floristic region.

the flowers. Inner segments slightly narrower than the outer. The ovary is sessile, not stipitate.

Habitat and distribution

The species occurs in grassland at the margin of *Combretum-Terminalia* woodland, in annually flooded meadows near river banks, recorded from the Illubabor and Wellega floristic regions. It appears to be endemic to Western Ethiopia and the Equatorial province of the Sudan. The flowering period is from April to May.



Drimiopsis botryoides

2. *Drimiopsis botryoides* Baker

The Greek species epithet, '*botryoides*' means 'like a bunch of grapes' and refers to the dense inflorescence with globose flowers. It was described by Baker in 1870 on material from East Africa without precise locality. Within Eastern Africa it is easily distinguished by its broad leaves and the spreading outer tepals, leaving the inner ones alone to close the flower. The white flowers immediately separate it from the only other Ethiopian species, *Drimiopsis spicata*.

- Description** Plants up to 20 cm long. Leaves broadly lanceolate, up to 17×8 cm. Inflorescence subspicate, pedicels ca 1 mm long. Tepals white, ca 3 mm long, outer ones spreading at anthesis, inner connivent, usually wider than the outer.
- Habitat and distribution** The species is only known from bushland, altitude not known. It is rare and has only been recorded from the Sidamo floristic region (possibly crossing the border into Bale). The Ethiopian material represents the northernmost extension of the species, otherwise widespread in Eastern Africa. The flowering period in Ethiopia is from April to May.

4. LEDEBOURIA *Roth*

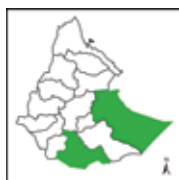
This genus is closely related to *Drimiopsis*, including plants with basal leaves which are spotted and narrowly to broadly lanceolate. *Ledebouria* differs, however, by having reflexed tepals, revealing the stamens and style, which are hidden by the tepals in *Drimiopsis*. The flowers are further supported by bracts, and the flowers always have purplish-violet stamens and style, often also the tepals. All taxa described before 1970 were originally included in the genus *Scilla*, a genus with blue tepals, distributed mainly in Europe to Asia Minor and Caucasus, possibly also with representatives in Africa. To define the generic boundaries more investigations are needed. It is clear, however, that *Ledebouria* is more closely related to *Drimiopsis* than to *Scilla*.

In *Ledebouria* the scape is more or less flexuous to prostrate. The inflorescence is a lax to dense raceme, with flowers supported by minute bracts. The pedicels are erect to ascending. The tepals, green to purplish, are free or united at the base, reflexed for shorter or longer parts of their length. The filiform filaments are fused with the tepals at the base. The ovaries are slightly stalked ('stipitate') with few ovules. The capsules and seeds are otherwise similar to those found in *Drimiopsis*.

The genus *Ledebouria* includes some 20 species in Africa, Arabia and India, of which 6 are represented in Ethiopia. Taxonomically it is a complicated group, and more field observations are welcomed.

Key to the species

- | | |
|--|--------------------------|
| 1. Tepals 9 mm long or more | 2 |
| - Tepals 8 mm or less | 3 |
| 2. Pedicels up to 3 mm long | 1. <i>L. somaliensis</i> |
| - Pedicels 5 mm or more | 2. <i>L. kirkii</i> |
| 3. Leaves linear up to 7 mm wide | 3. <i>L. edulis</i> |
| - Leaves lanceolate to cordate, more than 15 mm wide | 4 |
| 4. Tepals about 3 mm wide, 1–2 times longer than wide, only reflexed in the apical part. | 4. <i>L. urceolata</i> |
| - Tepals up to 2 mm wide, more than 2 times longer than wide, reflexed from the lower part | 5 |
| 5. Leaves cordate to broadly lanceolate, with purple papillae above | 5. <i>L. cordifolia</i> |
| - Leaves narrowly lanceolate, without papillae above, but often with purple spots beneath | 6. <i>L. revoluta</i> |



*Ledebouria
somaliensis*

1. *Ledebouria somaliensis* (Baker) Stedje & Thulin

The species epithet refers to Somalia from where this species was first described by Baker in 1892, then referring it to the genus *Scilla*. Stedje and Thulin, when revising Hyacinthaceae on the Horn of Africa, transferred the species to *Ledebouria* in 1995. It is a robust plant, recognised by its large flowers (segments 9 mm or more) and its short pedicels (up to 3 mm). The closest relative appears to be *L. kirkii*, which has longer pedicels.

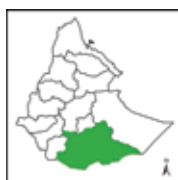
Description

Plants up to 30 cm long. Leaves lanceolate, up to 17×3 cm. Inflorescence 5–20 cm long, relatively lax with up to 70 flowers. Pedicels 1–3 mm long. Tepals green to purple, 9–11 mm long, reflexed at anthesis. Filaments, usually purplish, 7–9 mm long. Capsule c. 8 mm long, seeds c. 5 mm long.

Habitat and distribution

The species is found in grassland, bushland or open woodland, on sandy or rocky ground between 400 and 1500 m, recorded from the Sidamo and Harege floristic regions. It is otherwise found in adjacent Somalia and Kenya. The flowering period in Ethiopia is early in the rains, from April to June and in November.

Fig. 92.
Ledebouria somaliensis,
from Sidambale
bridge, Sidamo
floristic region.



Ledebouria kirkii

2. *Ledebouria kirkii* (Baker) Stedje & Thulin

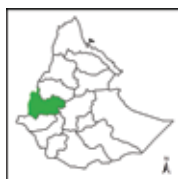
The species epithet refers to the collector, Kirk, who collected the plant for the first time in Zanzibar. Like the former species it is among the largest *Ledebouria* species, but differs by its longer pedicels.

Description

Plants up to 40 cm long. Leaves lanceolate. Inflorescence c. 8 cm long, lax. Pedicels 5–9 mm long. Tepals greenish c. 10 mm long, reflexed at anthesis. Filaments purple c. 8 mm long. Capsules and seeds as in *L. somaliensis*.

Habitat and distribution

The species grows in open woodland, on rocky places, and it is found around 900 m in the Sidamo and Bale floristic regions. It is otherwise widespread in Somalia, Kenya and Tanzania. The flowering period not recorded.



Ledebouria edulis

3. *Ledebouria edulis* (Engler) Stedje

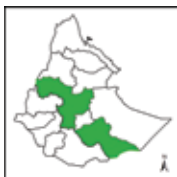
The species epithet ‘*edulis*’ means edible. The species was described in the genus *Scilla* by Engler in 1892 based on material from the Sudan. It was later transferred to *Ledebouria* by Stedje in 1995.

Description

Plants small and slender, up to 15 cm long. Leaves linear, c. 12×0.7 cm. Inflorescence c. 3 cm long. Pedicel c. 2 mm long. Tepals c. 5 mm long. Capsules and seeds not seen.

Habitat and distribution

The species has only been collected once, in the Wellega floristic region, and no information is available on habitat and flowering period.



Ledebouria urceolata

4. *Ledebouria urceolata* Stedje

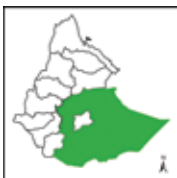
The species epithet refers to the flower form, which means urn-shaped. It was described by Stedje in 1995, based on material from the Bale floristic region. In all the other representatives of the genus the tepals are reflexed for more than half of their length, but in this species only the outermost parts are recurved. It is possibly the most ornamental of the species with its deep purple bell-shaped nodding flowers.

Description

Plants up to 30 cm. Leaves lanceolate, up to 9×3 cm. Inflorescence 3–12 cm long, moderately dense with up to 50 flowers. Pedicels 5–10 mm. Flowers purple, urn- to bell-shaped. Tepals $4-6 \times c. 3$ mm. Filaments *c.* 4 mm long. Capsule *c.* 5 mm long.

Habitat and distribution

The species is found in rocky outcrops or on stony river banks between 2500 and 2700 m. It is recorded from the Gojam, Shewa, and Bale floristic regions, and it is not known elsewhere. Flowering period from August to September.



Ledebouria cordifolia

5. *Ledebouria cordifolia* (Baker) Stedje & Thulin

The species epithet '*cordifolia*' means that the leaves are cordate, that is more or less heart-shaped. It was described by Baker in 1898 in the genus *Scilla*, based on material from Malawi, and later transferred to the genus *Ledebouria* by Stedje and Thulin in 1995. It is a striking little plant with one or a few prostrate leaves, clasping the stem, often covered by purple papillae and with rather small flowers.

Description

Plants small, up to 15 cm. Leaves cordate to broadly lanceolate, usually petiolate, leaf blade up to 8×4.5 cm, often covered with purple papillae on the upper surface. Inflorescence up to 8 cm long with up to 60 flowers. Pedicels 5–8 mm long. Flowers purplish, with tepals 3–4 mm long. Capsules and seeds not seen.

Habitat and distribution

The species is found in clearings in bushland or woodland between 1000 and 1980 m, recorded from the Shewa, Sidamo, Bale, and Harerge floristic regions. Outside Ethiopia it is widespread in Eastern Africa south to Malawi (although recent molecular analyses might indicate that it is a polyphyletic species, and that splitting into more species might be justified). The flowering period Ethiopia is two-peaked, around April and around October.



Ledebouria revoluta

6. *Ledebouria revoluta* (L.f.) Jessop

The species epithet refers to the revolute, meaning reflexed tepals, (a trait certainly shared with most species of *Ledebouria*). The son of Linnaeus described it on material from the Cape, already in 1782, referring it to the genus *Hyacinthus*. Jessop transferred it to *Ledebouria*

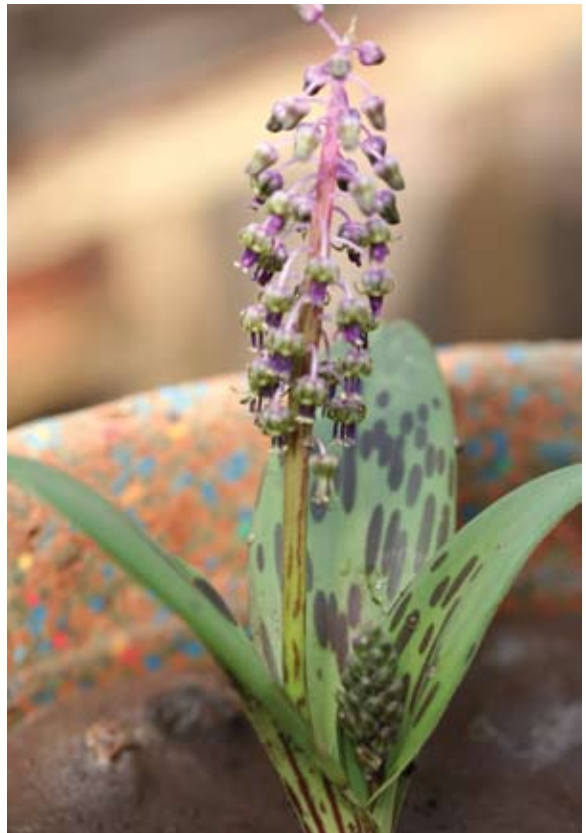


Fig. 93.
Ledebouria revoluta,
cultivated plant
originally from
Welisso, Shewa
floristic region.

in 1970. It has small flowers, like the former species, but have narrowly lanceolate, not cordate, leaves, and it also lacks the papillae of *L. cordifolia*.

Description Plants 9–35 cm long. Leaves lanceolate, up to 18 × 8 cm, most often much narrower, often with purple spots or lines. Inflorescence 3–10 cm long, relatively lax to dense with up to 60 flowers. Pedicels 3–12 mm long. Flowers greenish to purplish. Tepals greenish 4–8 mm long. Capsule c. 5 mm long.

Habitat and distribution The species grows in grassland or open bushland in clay and sandy soils between 450 and 2800 m. It is recorded from most floristic regions of Ethiopia and Eritrea, and it is widespread all over tropical and southern Africa. The species is polymorphic and more studies are needed. The flowering period in Ethiopia is mainly April to June, but flowers have also been collected in September to November.

5. *DRIMIA* Jacq.

A genus with white to pink flowers, most often producing the flowers before the leaves. Like *Schizobasis* it has bracts carrying a spur (pocket-like extension) at the base, and sometimes even an additional one in the middle. The function of these spurs is not known.

The leaves are linear to lanceolate. The erect scape carries a spicate inflorescence that is lax or condensed. The pedicels are erect or ascending. The tepals are free or united. The filaments are free, but may be fused with the tepals in the basal end. The ovary has several ovules per locule, producing multi-seeded capsules that are more or less ovoid in shape. The seeds are black, most often flattened and winged, with a more or less elliptic outline.

The genus has often been split into two, *Drimia* and *Urginea*, the former including plants with more or less tubular flowers, the latter with more or less stellate flowers. There are, however, gradual transitions, and the two flower morphs are not correlated with other variable traits.

The genus includes about 100 species in Africa and the Mediterranean area with extensions to India. Six species are recorded from Ethiopia.

Key to the species

(Two rare species, *D. macrocarpa* and *D. brachystachys* are only included in the key and not further described in the text).

1. Tepals up to 5 mm long; pedicels up to 5 mm long 1. *D. exigua*
 - Tepals 5 mm or more; pedicels usually longer than 5 mm, if shorter then the tepals at least 8 mm 2
2. Inflorescence dense, pedicels 5–8 mm long 2. *D. simensis*
 - Inflorescence lax to moderately dense, pedicels usually more than 8 mm long 3
3. Tepals ca 18 mm long, pedicels more than 30 mm long, in Ethiopia only known from Sidamo *D. macrocarpa*
 - Tepals up to 11 mm long; pedicels usually shorter than 30 mm 4
4. Inflorescence lax, up to 15 flowers per 10 cm; flowers pinkish-green 3. *D. indica*
 - Inflorescence dense, more than 25 flowers per 10 cm; flowers whitish with coloured tepal keels 5
5. Inflorescence more than 20 cm long 4. *D. altissima*
 - Inflorescence up to 10 cm long, in Ethiopia only known from Shewa *D. brachystachys*



Drimia exigua

1. *Drimia exigua* Stedje

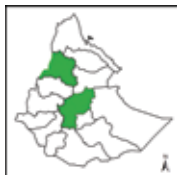
The species epithet '*exigua*' means weak or feeble, referring to the small and slender habit of the plants. Stedje described it in 1984, based on material from Shewa. It is recognised within the genus on its minute flowers, tepals 4–5 mm long only.

Description

Plants small and slender. Leaves linear, hysseranthous, red spotted towards the base, c. 25 × 0.8 cm long. Raceme up to 15 cm long with about 30 flowers. Bracts up to 3 mm long with spurs up to 5 mm long. Pedicels up to 5 mm long. Tepals 4–5 mm long, united for about 1 mm, light greenish-brown with a purplish-brown keel. Filament filiform, white, anthers light yellow. Capsule subglobose, up to 11 × 10 mm. Seeds black, winged, up to 6 mm long.

Habitat and distribution

The species is found in recently burnt open woodland from 1400 to 1600 m, and has so far only been collected in the Kefa and Shewa floristic regions. It is a narrow endemic, not known from elsewhere. The species was described on material flowering in a greenhouse, and the general flowering period in the field is so far not known.



Drimia simensis

2. *Drimia simensis* (Hochstetter) Stedje

The species epithet '*simensis*' refers to the Semien Mountains in Ethiopia. It was described by Hochstetter in 1851 in the genus *Urginea*, later transferred to *Drimia* by Stedje in 1995. It differs from the other species in the genus by its very dense inflorescence.

Description

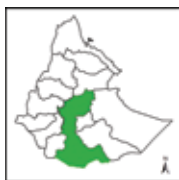
Plants robust, up to 50 cm. Leaves lanceolate, about 33×3.5 cm. Raceme dense and short, up to 8 cm long. Pedicels 5–8 mm long. Tepals lanceolate 10×3 mm. Fruit and seeds not known.



Fig. 94. *Drimia simensis*, cultivated plant originally from Semien Mountains, Gonder floristic region.

Habitat and distribution

The plants grow in disturbed mountain grassland from about 2900 to 3300 m, being a narrow endemic, only known from Gonder and Shewa floristic regions. The flowering period is March to April.



Drimia indica

3. *Drimia indica* (Roxburgh) Jessop

The species epithet refers to India, from where the species was described by Roxburgh as early as in 1824, in the genus *Scilla*. It was thereafter placed in *Urginea* for more than hundred years, until Jessop referred the species to *Drimia* in 1977. It is recognised by its very lax inflorescence and the pinkish-greenish flowers.

Description

Plants up to 50 cm. Leaves appearing after the flowering, 30×0.4 –1.8 cm. Inflorescence a lax raceme with 5–25 flowers. Bracts up to 2 mm long with spurs of the same length. Pedicels up to 4.5 mm long, patent or ascending. Tepals united from the base up to 1.5 mm, pinkish to greenish, 10–11 mm long. Filaments united with the tepals at the base, free part 5–6 mm long. Capsule 16–18 mm long, and seeds *c.* 9 mm long.

Habitat and distribution

The species has been collected in bushland or open land on thin sandy soils over rocks, from 1350 to 2280 m, only been recorded from the Shewa and Sidamo floristic regions, otherwise it is widely distributed in Tropical and South Africa and it reaches India in the east. In Ethiopia flowering specimens have been collected in June and in November, apparently just before the rains start.



Drimia altissima

4. *Drimia altissima* (L.f.) Ker-Gawler

The species epithet refers to the size of the plant (*alt* = tall, '*altissima*' = very tall). The inflorescence may in fact reach 180 cm. It was described by the son of Linnaeus in the genus *Ornithogalum* already in 1781, based on material from South Africa (Cape), and was transferred to the genus *Drimia* by Ker-Gawler in 1808. It differs from the other species in the genus by its height and robustness.

Description

Plants usually tall and robust, up to 180 cm. Large bulbs, about 10 cm across, often green and visible above-ground. The flowering stalk appears before the leaves (hysteranthous). Leaves lanceolate, up to 40×4 cm. Inflorescence a $\pm$ dense raceme, up to 60 cm long



Fig. 95. *Drimia altissima*, from Shewa floristic region.

and with up to 500 flowers. Bracts *c.* 5 mm long, with spurs *c.* 2 mm. Pedicels 13–40 mm long, patent. Tepals free or united up to 2 mm, 5–10 mm long, white or greenish white with a green or purplish band on the outside. Filaments flattened, slightly triangular, free part 4–7 mm long. Capsule subglobose, sometimes emarginate (that is with sunken apex), 10–14 × 9–15 mm. Seeds flat, 5–9 mm long.

Habitat and distribution

This species is found in more or less wooded grassland or bushland, often overgrazed or recently burnt, on black loamy soils, from 800 to 2600 m. It is found all over Ethiopia except in the extreme lowland of Afar. It is also widespread in tropical and southern Africa west to Senegal and south to the Cape in South Africa. The main flowering period in Ethiopia is from November to March.

6. ALBUCA L.

This genus differs from the other genera in the family by its yellow flowers with greenish keels, where the inner tepals close the flower, hiding stamens and ovary. Further, the filaments have expanded bases clasping the ovary. The ovary is ridged, and space is created between the clasping filaments and the ovary wall, thus creating containers that are filled with nectar from the nectaries in

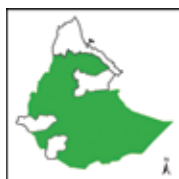
the ovary walls (septal glands).

The leaves, linear to lanceolate, are produced simultaneously with the flowers. The erect scape carries a relatively lax racemose inflorescence. In contrast to *Drimia*, the bracts do not carry spurs. The capsule is ovoid and contains several flattened seeds.

The genus is widely distributed in Africa south of the Sahara (extending to Arabia), including about 30 species. Only two species are recognised in Ethiopia.

Key to the species

- | | |
|--|-------------------------|
| 1. Plants ± robust; leaves more than 5 mm wide | 1. <i>A. abyssinica</i> |
| - Plants small and slender, leaves filiform, 1 mm wide | 2. <i>A. tenuis</i> |



Albuca abyssinica

1. *Albuca abyssinica* Jacquin

The species epithet refers to Abyssinia, the former name of Ethiopia. Jacquin described the species as early as in 1783. It is uncertain from where the material he used was obtained. It is a very variable species complex, distinguished from *A. tenuis* by robustness and leaf width.

Description

Plants 20–150 cm tall. Bulbs 2–8 cm in diameter, with or without fibrous remnants of old leaves. Leaves lanceolate, 20–100 × 0.5–5 cm, glabrous or ciliate (rarely pubescent). Pedicels 2–20 mm long. Tepals 8–35 mm long. Style 1.5–3 times as long as the ovary. Capsule 1–2 cm long, seeds flat, 3–7 mm across.

Habitat and distribution

The species is found in grassland, bushland or woodland, on red or brown loamy soils from 700 to 3240 m. It is found in most floristic regions in Ethiopia, except the eastern ones. It is otherwise widely distributed in Africa south of the Sahara, extending to Arabia. The main flowering period in Ethiopia is from April to May, in the southern parts with a second period from September to November.

The species is very variable and several species have been described in Ethiopia. Here they are all ‘lumped’ to *Albuca abyssinica*. One species, *A. blepharophylla* Cufod. with pubescent leaves, was described from Sidamo floristic region. It can easily be crossed with *A.*



Fig. 96. *Albuca abyssinica*, from between Mega and Megado, Sidamo floristic region.

abyssinica, and sometimes glabrous and pubescent forms are found in the same population. *Albuca chaetopoda* Chiov. was described from Somalia, characterised by fibrous remains from old leaves surrounding the basal leaves. This trait is not clearly correlated with other traits, and it is here not regarded as important enough to justify specific rank. More studies in the field are needed to sort out and understand the variation in this very variable species. Possibly subspecies might be justified.



Albuca tenuis

2. *Albuca tenuis* Knudtzon

The species epithet '*tenuis*' refers to the relatively tiny size of this plant. It was described based on Kenyan material by Knudtzon in 1986. Compared to the former species, it is recognised by the filiform and often spirally twisted leaves.

Description

Small plants up to 15 cm. Bulbs c. 2 cm in diameter, with or without fibrous remnants of old leaves. Leaves filiform, often spirally twisted, 10×0.1 cm. Pedicels 2 mm long. Tepals 10–11 mm long. Style about as long as the ovary. Capsules and seeds not known.

Habitat and distribution

The species has been found in disturbed and eroded *Acacia* bushland or woodland between 1450 and 1900 m, recorded from the Shewa and Bale floristic regions. It is otherwise known from Kenya. In Ethiopia it has been collected flowering in October.

7. ORNITHOGALUM L.

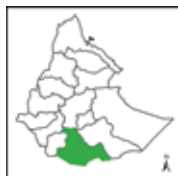
This genus is probably closest related to *Albuca*, differing in simpler flowers, being open, and lacking the specialised stamens of the latter.

The leaves are produced $\pm$ simultaneously with the flowers. The leaves are linear to lanceolate. The erect scape carries a lax to dense inflorescence. The pedicels are erect to patent at anthesis. The bracts do not carry a spur. The tepals are white, most often with greenish keels, patent, not connivent as in *Albuca*. The filaments are free and flattened, never clasping the ovary. The capsules are subglobose with irregularly flattened seeds.

The genus is widely distributed in Africa, southern Europe, and western Asia and includes about 200 species, of which 3 are represented in Ethiopia.

Key to the species

1. Plants small, up to 15 cm tall; leaves filiform; flowers 2–10 in the inflorescence 1. *O. gracillimum*
- Plants more than 20 cm tall; leaves narrowly lanceolate; flowers more than 30 in the inflorescence 2
2. Tepals 1.5–1.7 cm long with 3–5 distinct green veins; ovary on a short wide stalk; pedicels 2.5–5 cm 2. *O. donaldsonii*
- Tepals 0.6–0.9 cm long with several veins; ovary sessile; pedicels shorter than 1.2 cm 3. *O. tenuifolium*



Ornithogalum gracillimum

1. *Ornithogalum gracillimum* R.E.Friis

The species epithet '*gracillimum*' refers to the small and slender habit of these *gracile* plants. It was described in 1927 from plants collected on Mt. Kenya by the Swedish botanist Robert E. Friis. It is easily recognised from the two other *Ornithogalum* species by its small size, its

filiform leaves and its few-flowered inflorescence.

Description Small plants up to 15 cm tall. Bulb up to 2 cm in diameter. Leaves filiform, up to 12 cm long. Scape up to 8 cm. Inflorescence with 2–10 white flowers. Pedicels 5–20 mm. Tepals *c.* 4 mm long, with few scattered veins. Filaments triangular. Ovary on a short delicate stalk, 0.3 mm long. Capsule 3–4 mm long, with seeds 1.2–2 mm across.

Habitat and distribution The plants grow on shallow soils on granite outcrops around 1450 m, only recorded in the Sidamo floristic region. It is otherwise found in Kenya and Uganda. In Ethiopia it flowers in April.



Ornithogalum donaldsonii

2. *Ornithogalum donaldsonii* (Rendle) Greenway

The species epithet refers to the collector, Donaldson Smith, who collected the plant in Harerge. It was described in the genus *Albuca* by Rendle in 1896 and later transferred to *Ornithogalum* by Greenway in 1969. It is easily recognised by its long pedicels (longer than 2.5 cm) and large flowers (tepals longer than 15 mm).

Description Robust plants, 20–50 cm tall. Bulb up to 6 cm in diameter. Leaves lanceolate *c.* 40 × 3.5 cm. Inflorescence with 50–150 flowers. Pedicels 2.5–3.5 cm long. Bracts lanceolate, up to 3.5 cm. Tepals 15–17 mm long, with 3 or 5 distinct green veins. Filaments flattened, triangular, *c.* 10 mm long. Ovary on a short wide stalk. Capsule *c.* 15 mm long. Seeds *c.* 8 mm in diameter.

Habitat and distribution The species is found in woodland, bushland or wooded grassland from 850 to 1520 m, recorded from the Sidamo, Bale and Harerge floristic regions. It is otherwise found in Somalia, Kenya and Tanzania. The flowering period in Ethiopia is from May to April, in the south also from October to November.



Ornithogalum tenuifolium

3. *Ornithogalum tenuifolium* Delaroche

The species epithet means with narrow leaves, in reality not very characteristic of the species. It was described in 1811 without known origin. It is robust like *O. donaldsonii*, but differs by the shorter pedicels and the smaller flowers.

Description Plants from slender to robust, up to 150 cm. Scape 35-110 cm. Leaves lanceolate up to 70 × 3 cm. Inflorescence with 30-150 flowers. Pedicels 2-11 mm. Bracts 6-22 mm long. Tepals 6-9 mm long, with several veins assembled in a green midrib. Filaments 4-6 mm long, ovate with or without a tooth on each side. Ovary sessile. Capsule *c.* 9 mm long. Seeds *c.* 5 mm across.

Habitat and distribution The species grows in woodland on black soils, sometimes in heavily grazed areas between 1150 and 2300 m. It has been collected in the Gamo-Gofa, Sidamo, Bale, and Harerge floristic regions, and otherwise in large parts of Africa south of the Sahara. The flowering period in Ethiopia is April to May and September to November.

ALLIACEAE

The family includes herbs with bulbs, bulb-like corms, or rhizomes. The underground parts usually produce a smell of garlic or onion when squashed. Leaves are produced in a basal rosette, or they are 2-ranked. The inflorescence is an umbellate or a globose head, subtended by 1–2 membranous bracts. The flowers are commonly regular, the perianth varying from white to pink, blue, violet or purple, sometimes yellow. The 6 tepals are more or less equal. The stamens are attached to the base of the tepals. The filaments are flattened. The ovary is superior with nectar producing grooves in the walls. The fruit is a capsule with few to many seeds, often somewhat triangular in cross section.

Distribution and classification

The family Alliaceae is mainly distributed in the temperate regions, both in the southern and northern hemispheres. Only a few species reach the tropics. It is represented by c. 13 genera and 700 species worldwide. In the Flora area, it is represented by two genera: *Allium* and *Agapanthus*. The genus *Agapanthus*, represented by *A. praecox*, is only known in cultivation in Ethiopia and Eritrea, and is not further treated here. The genus *Allium* is represented by indigenous and cultivated taxa.

Reproduction

A large number of species with bulbs have vegetative propagation. Often some of the flowers are substituted by bulbils that function as vegetative dispersal units.

Use and chemistry

One of the characteristic features of the family is the absence of alkaloids which are found in related families as Amaryllidaceae. Members of the genus *Allium* are known to contain sulphur-compounds which contribute to their particular smell and taste. They also include flavones and flavonols. In fact, *Allium* species can be separated into three groups based on these compounds: those that have only flavones, those with only flavonols and those with both. Species of the genus have been in cultivation since the first periods of agriculture in the Old World. Onions, garlic, leek, and chives belong in the genus.

ALLIUM L.

The genus includes bulbous herbs, easily recognized by the characteristic smell of garlic or onion when cut or crushed. The underground parts are single bulbs or a cluster of slender bulblets. The leaves are tubular and hollow, linear or flattened. The inflorescence is an umbel, supported by 1–2 bracts, on a leafless stalk. The flowers are often subtended by linear bracteoles. The tepals are 1-3 veined, free or joined at the base. The stamens are placed in two whorls of three. The seeds are black, compressed, three-angled to almost globose, not winged.

Between 500 and 600 species are recognized globally with the main center of diversity in the Mediterranean region. Five species are represented in the Flora area, only two (*A. alibile* and *A. subhirsutum*) are indigenous and are presented below.

Key to the species

1. Leaves cylindrical, hollow; spathe persistent; inner filaments with a small basal tooth at each side 2
 - Leaves flattened, keeled, not hollow; spathe persistent; inner filaments, when present with 3 or more lateral projections or teeth 3
2. Leaves and inflorescence stalk slender, less than 4 mm in diameter, base not widened; flowers lilac; bulbs densely clustered along rhizomes A. schoenoprasum (chives)
 - Leaves and inflorescence stalk more than 4 mm wide; stalk widening at the base; flowers white; bulb solitary or clustered, rhizome absent A. cepa (onions)
3. Bulb made of several more or less equal bulblets or single and virtually indistinguishable from the base of the scape; plants cultivated 4
 - Bulb single and prominent, with or without small, spherical bulblets; plants not cultivated 5
4. Bulb well developed, spherical or ovoid, with several to many angular bulblets held in a common covering; leaves less than 2.5 cm wide; flowers often poorly developed and replaced by bulbils A. sativum (garlic)
 - Bulb almost indistinguishable from base of stalk except for being lighter coloured; bulblets if present, small and spherical; leaves over 2.5 cm broad; umbels with well developed flowers A. porum (leek)

5. Umbel without bracteoles; anthers shorter than the perianth; leaves hairy at least along the margins 1. *A. subhirsutum*
 - Umbel with a ring of scarious bracteoles; anthers longer than the perianth; leaves smooth 2. *A. alibile*
-

1. *Allium subhirsutum* Linnaeus



Allium subhirsutum

The specific epithet '*subhirsutum*' refers to the hairy nature of the plants. It was described by Linnaeus in 1753 from a plant deposited in the Linnean herbarium.

The species is distinguished from the next species by its umbel without bracteoles and the leaves hairy at least along the margins. The herb smells mildly of garlic when crushed. Only one of the subspecies is represented in the Flora area.

subsp. *spathaceum* (Steud. ex A. Rich). Dufjes

The subspecific epithet '*spathaceum*' refers to the conspicuous spathes (bracts surrounding the inflorescence). The name of the subspecies was proposed by Steudner and properly described as *A. spathaceum* by A. Richard in 1851 from a plant collected in Demerki in Semien, Gonder floristic region. The taxon was later reduced to a subspecies by Dufjes in 1976.

Description

Bulb globose to ovoid. Leaves 1–3, linear, flat or slightly keeled, 8–50 × 0.2–2 cm, hairy along the margins; sheaths 1.5–14 cm, mostly below ground, glabrous or hairy particularly at the top. Inflorescence stem solitary, rarely 2–3, solid, uniform in thickness. Inflorescence an umbel or spherical cluster, 2–7 cm in diameter, few to many flowered. Pedicels 10–40 cm long. Perianth segments white, elliptic or oblong, 5–9 mm long. Capsule subglobose, 3–6 mm in diameter. Seeds black.

Habitat and distribution

It grows in grassy meadows between 1750 and 3500 m in Gonder and Harerge floristic regions in Ethiopia, and in Eritrea. It also occurs in northern Sudan and northern Somalia. The main flowering period in Ethiopia is in August to October.



Fig. 97. *Allium subhirsutum*, from Semien Mountains, Gonder floristic region.



Allium alibile

2. *Allium alibile* Steud. ex A. Rich.

The specific epithet ‘*alibile*’ refers to the nutritious (alibilis) bulb. The species is distinguished from the former species by its umbel with the ring of bracteoles and the smooth leaves.

Description

Herb with a strong smell of garlic when crushed. Bulb small, corm-like globose to oblong. Leaves 2–5, flat or with mid-rib and keel in the lower parts, smooth along the margins. Inflorescence a dense spherical umbel, few to many flowered. Pedicels unequal, the ones at the center twice as long as the outer ones. Perianth segments white, flushed pale purple, with dark green mid-veins, elliptic to elliptic obovate, 3.5–5 mm long. Capsule enclosed by the persistent calyx.

Habitat and distribution

It grows in open dry *Acacia* woodland on light gypsum soil with a rich herb flora, and also in montane grassland at about an altitude of 1600 m in Tigray and Shewa floristic regions. It also possibly occurs in the Sudan. The main flowering period in Ethiopia is in September.

COLCHICACEAE

The family includes erect or twining perennial herbs with underground corms (which sometimes becomes rhizomatous). The leaves are basally concentrated or scattered along the stem with leaf-blade linear to lanceolate or ovate, sessile or sheathing basally, parallel veined often with a distinct mid-rib, sometimes ending in a tendril. The inflorescence is axillary, racemose, cymose or rarely a solitary flower with or without bracts. The flowers are showy with 6 equal or sometimes unequal tepals that are free from each other or fused at the base for some length. The colour of the perianth varying from white to purple, red or yellow or brown, more often two-coloured. The 6 stamens are free or attached to the petals with rounded or flattened filaments. The ovary is superior with 3-locules and the fruits are capsules, most often opening along the walls dividing the ovary into three rooms (septicidal), more rarely opening between the separating walls (loculicidal) as in *Iphigenia*.

Distribution and classification The family Colchicaceae is distributed both in the temperate and tropical regions of the Old World (Africa, Asia and Australia) with extension to the New World (Europe & North America). The highest concentration of the species is in the temperate zones of South Africa. Globally it is represented by 19 genera and 225 species, of which, 5 genera and 7 indigenous species are known to occur in Ethiopia and Eritrea.

Reproduction The flowers show a clear adaptation to insect pollination. The presence of nectar, which in this family is produced in nectaries at the basis of the petals, attract insects. Also the often conspicuous colour patterns are evidences for this phenomenon.

Chemistry and use Colchicine-like alkaloids are common in many members of the family. These alkaloids are extremely poisonous and cause severe damage to livestock. They also have wide applications in medicine, pharmacological and

biological laboratories. Colchicine, commonly found in *Gloriosa* and *Merendera*, has been used in the treatment of gout being effective against severe attacks. But its use has been restricted due to its high toxicity. Colchicine disturbs the cell division, and this property has been used in plant breeding. Since it interferes with mitosis, it results in the multiplication of chromosomes in the nucleus without the process of cell division. As the cell division could start with the withdrawal of colchicine treatment, the process allows a new generation of polyploids and possible varieties of a plant. *Gloriosa* and *Colchicum* are used in horticulture.

Conservation Among the indigenous species, there is one endemic species, *Iphigenia pauciflora*, known only from Tigray, Shewa, Bale and Sidamo floristic regions in Ethiopia and in Eritrea; some near endemics, e.g. *Gloriosa baudii* known from the Gamo Gofa and Sidamo floristic regions and adjacent areas in Somalia and northern Kenya, *Littonia revoilii* known from NE parts of Ethiopia and adjacent areas in Somalia, Djibouti, and Yemen. *Merendera schimperiana* is widely distributed in Ethiopia, and in adjacent areas in Somalia and southern Arabia. The only threat to these species is severe habitat degradation, and adequate care is required in the area of their occurrence.

Key to the genera

1. Leaves scattered along the stem, alternate on usually scandent, annual stems; flower solitary; leaf-apex ending in tendrils 2
- Leaves basal, rosulate or distichous, on annual or perennial stems; flowers variously arranged; leaf- apex not ending in tendrils 3
2. Perianth segments recurved; style at right angles to ovary; flowers usually bent 1. *Gloriosa*
- Perianth segments not recurved; style straight; flowers $\pm$ erect 2. *Littonia*
3. Flowers in a capitulum overtopped by exterior petaloid bracts 3. *Androcymbium*
- Flowers not in a capitulum overtopped by exterior petaloid bracts 4
4. Flowers solitary or two together, rarely three from a rosette of leaves; perianth with a claw; stamens attached to the perianth segments; pedicels absent 4. *Merendera*

- Flowers solitary or 3–10 in a lax scorpioid arrangement on the stem; perianth without a claw; stamens not attached to the perianth segments; pedicels present

5. *Iphigenia*

1. GLORIOSA L.

The genus includes climbing geophytes with rhizome-like corms and scandent stems. The leaves are scattered along the stem, sessile, alternate or whorled, simple, ovate, attenuated into a terminally recurved tendril. The flowers are axillary on long pedicels. The perianth segments are free, equal, narrowly ovate-acuminate, entire or crisp, reflexed, yellow or red. The stamens have firm, spreading filaments. The style is filiform, bent sharply outwards at its base, with 3 short stigmatic branches.

The genus is easily recognised from the other members of the family, mainly by its scandent habit, conspicuous and attractive mixture of yellow, orange, and red flowers and leaves ending in tendrils. It is closely related to *Littonia*, from which it is easily distinguished by the sharply bending style in contrast to the straight style in *Littonia*.

The genus consists of two species, both of which occur in Ethiopia. Many tend to merge these two species into one as *G. superba*, but we believe the two species are distinct.

Key to the species

1. Climbing herb; leaf-blade 1.3–6 cm wide; stamens with filaments 2.2–3 cm long; style with deeply divided stigma, 4–12 mm long 1. *G. superba*
- Erect herb; leaf-blade 0.2–0.8 cm wide; stamens with filaments 1.2–2.3 cm long; style with shallowly divided stigma, 1.5–2(–3) mm long 2. *G. baudii*



Gloriosa superba

1. *Gloriosa superba* L.

The specific epithet '*superba*' refers to the beautiful (superb) flowers. It was described by Linnaeus in 1753 from a plant collected from Malabar, India by Hermann. It was also commonly known by the name *G. simplex* L.



Fig. 98. *Gloriosa superba*, from near Aleta Wendo, Sidamo floristic region.

The species is distinguished from the next species by its climbing habit, wider leaf-blade (1.3–6 cm) and deeply divided stigma.

It is also famous in horticultural circles with its various forms and colours and commonly known by the common English names: Glory lily, Flame lily and Climbing lily.

Description A variable climbing herb up to 3 m high. Leaves along the stem sessile, opposite, subopposite or whorled or alternate; leaf-blade elliptic, lanceolate to ovate, 7.5–16 × 1.3–6 cm, glabrous, coiled at the apex with tendrils. Flowers solitary at the axils of leaves; pedicels 4.5–16.5 cm long, cernuous (bending) at the tip. Perianth segments broadly elliptic to obovate, 3.5–8 × 1–3 cm, acute at the apex, narrowing to the base, entire to crisped at the margin; variable in colour, bright-red, orange or yellow. Stamens with filaments 2.2–3 cm long; anthers linear, 0.8–1.5 cm long. Ovary cylindrical-ovoid, 0.8–1.5 cm long; style 2.5–3.8 cm long including 3 stigma branches, 0.4–1.2 cm long. Capsule 4–5 cm long.

Habitat and distribution This species grows in *Acacia-Commiphora* and *Combretum-Terminalia* woodland, in open places in forest, in thickets on roadsides and ditches between 500 and 2000 m, and it is widespread in Ethiopia and Eritrea. It is also common in tropical Africa, southern Africa and Madagascar. It also occurs in tropical Asia. The main flowering period in Ethiopia is from May to August.

*Gloriosa baudii*

2. *Gloriosa baudii* (Terr.) Chiov.

The specific epithet '*baudii*' is given in honour of one of the collectors, Baudi, from whose collection the type was designated. The species was described by Terracciano in 1892 as *Littonia baudii* with the type material collected from Gerar Amaden in the Harerge floristic region by Baudi and Candeo. It was transferred to the genus *Gloriosa* by Chiovenda in 1916. It was also known by the name *G. minor*, described by Rendle from a plant collected from west of Shebelle River in Bale floristic region by Donaldson-Smith.

The species is distinguished from the former species by its erect habit, narrower leaf-blade (0.2–1.2 cm) and deeply divided stigma. In the Flora of Somalia (Thulin 1995) it is regarded as an ecotype of *G. superba* adapted to arid habitats.



Fig. 99. *Gloriosa baudii*, from northern Kenya.

Description Erect herb 20–50 cm high. Corm obovate, 4.5×1.0 cm; tunics brownish. Leaves along the stem, sessile, subopposite to alternate; leaf-blade linear-elliptic, $5\text{--}11 \times 0.2\text{--}0.8$ cm, glabrous to pubescent, apex attenuate or with tendrils. Flowers solitary; pedicel 3.5–9 cm long. Perianth bright-red or yellow and red, sometimes fused for 4–5 mm at the base; leaf-blade oblanceolate, $2.5\text{--}5.5$ cm $\times$ 4–8 mm. Stamens with filaments 12–23 mm long, anthers 3–7 mm long. Pistil with style 14–25 mm long with 3-branched stigma, 1.5–2(–3) mm long. Young fruit 15 mm long.

Habitat and distribution It grows on stony ground and open bush on red sandy soil between 230–900 m in Harerge and Gamo Gofa floristic regions. The species is thus only known in adjacent areas in southern and south eastern Ethiopia, western Somalia and northern Kenya, an area which could be referred to as the Ethio-Somalia-Kenya triangle and which harbour a number of endemics. The main flowering periods in Ethiopia is from October to November, also from March to May.

2. LITTONIA Hook.

The genus includes climbing geophytes with a small tuber bearing short spreading lobes. The stems are usually simple, scandent or erect. The leaves are cauline, verticillate below, alternate above, linear to ovate, attenuated into a pointed apex or recurved tendril. The flowers are axillary in a cymose inflorescence on the upper part of the stem, on long pedicels. The perianth segments are equal, persistent, ascending and slightly saccate at the base. The stamens are short and filiform. The style is also short with 3-falcate stigmatic branches.

It is closely related to, or may possibly be congeneric with, the genus *Gloriosa*, in general habit and in having leaves ending in tendrils. However, in *Gloriosa* the style is sharply bent, while it is straight in *Littonia*.

The genus consists of *c.* 8 species, occurring mainly in Africa and extending to Arabia. Of these, only one species is known to occur in Ethiopia.



Fig. 100. *Littonia revoilii*, from Somalia.



Littonia revoilii

Littonia revoilii Franch.

The specific epithet '*revoilii*' was given in honour of one of the collectors, Revoil from whose collection the type was designated. The species was described by Franchet in 1882, with the type material collected from Barroz valley in Somalia. It was also known by the names *Littonia hardeggeri* described by Beck in 1888 from Harerge and *Littonia minor* described by Deflers from Arabia.

Description

Erect or scandent geophyte, 15–35 cm high. Corm ovoid to globose, c. 1.7×1.5 cm. Leaf-blade linear to elliptic, 4.5–8.5 (-10) cm $\times$ 4.5 mm; lower ones whorled, upper ones alternate or opposite, sessile, attenuated into a recurved tendril at the apex. Flowers solitary; pedicel 2–5 cm long. Perianth segments elliptic, narrowing from the middle towards the base, reddish-yellow, cream flushed with brown or yellow; 1.2–2.5 cm $\times$ 2–5 mm. Stamens with filaments 8–10 mm long; anthers 3–4 mm long. Ovary with style 6–8 mm long and 3-branched stigma c. 5 mm long. Fruit 3-locular, 15–17 mm long, many seeded. Seeds $\pm$ globose, fleshy when fresh, obovate, 3 $\times$ 3 mm.

Habitat and distribution

The ecology of the species is poorly known in Ethiopia. It grows on sandy and stony ground in Somalia. It is only known from eastern part of Harerge floristic region and adjacent areas in Somalia, Djibouti, and Arabia. The main flowering period in Ethiopia is from October to January, also from April to May.

3. ANDROCYMBIUM Willd.

The genus includes stemless herbs or with short scapes. The corms are covered with hard dark tunics. The leaves are distichous, 2–many, linear to ovate-acuminate, canaliculate with a broad sheathing base. The flowers are solitary or many in a terminal capitulum surrounded by often large, petaloid, colourful bracts, the whole resembling one flower. The perianth segments are free, ovate acuminate, margins involute, with a pair of nectaries. The ovary is 3-locular, ovoid, deeply 3-sulcate, each locule attenuated into a style ending in a minute stigma.

The genus is one of the two (with *Merendera*) genera in the family that lack proper stems. *Merendera schimperiana*, the only member of the genus *Merendera*, has purple flowers.

The genus contains 30 species, mostly in South Africa, and one in North Africa and the Mediterranean region. Of these, only the following species is known to occur in Ethiopia.

Some *Androcymbium* species are cultivated in rock gardens and in green houses.



*Androcymbium
striatum*

Androcymbium striatum Hochst. ex A. Rich.

The specific epithet '*striatum*' refers to the fine linear markings or channels (*striae*) that are seen on the involucre bracts. The species name was originally coined by Hochstetter and formally described by A. Richard in 1851, based on the type material collected from Semien mountains by *Schimper*.

Description

Geophyte, 15–30 cm high. Corm ovoid, 1–2.5 × 0.6–2 cm; tunics firm, dark brown. Scape erect, bearing 2–3 ascending, glabrous leaves; blade linear or lanceolate 4–20 cm × 1.5–12 mm. Flowers 3–5 in a cluster; pedicels erect, 4–6 mm long, elongating to 10(–16) mm long in fruit; bracts ovate-cuspidate or oblong, 1.5–6.5 × 0.4–1.6 cm whitish with green veins. Perianth whitish, 7–9 mm long; blade of the segments 5–6 mm long and the claw c. 2 mm long. Stamens equal to the perianth or shortly exserted. Capsule ovoid, 9–11 mm long with the persistent style 3–5.5 mm long. Seeds reddish-brown, 1.3–1.5 × 1.3–1.5 mm.

Habitat and distribution

The species grows in open grassland with scattered *Acacia abyssinica*, *Euclea* scrub, degraded *Juniperus-Olea* remnants, open shallow soil, on bare gravely soil and in *Acacia drepanolobium* dominated grassland on black clay soil between 1500 and 2600 m in Tigray, Gonder, Shewa, Arsi, Bale, Sidamo and Harerge floristic regions in Ethiopia and in Eritrea. It also occurs in Kenya, Uganda, Tanzania, Zimbabwe to South Africa. The main flowering period in Ethiopia is from April to July.

4. MERENDERA *Ramond*

The genus includes geophytic herbs. The underground organ, the corm, is covered with tunics. The leaves are basal. The flowers are solitary or 2, rarely 3. The stamens are, inserted at the base of the perianth segments. The filaments are filiform and the anthers are versatile or basifixed. The ovary is 3-locular and the 3 styles are filiform, each with small and capitate stigmas.

The genus is represented by 15 species in Africa, Europe, and western Asia, and by a single species in Ethiopia.

The genus has recently been included in *Colchicum* by Nordenstam (1998). However, in our opinion the shape of the perianth and the style characters are distinct enough to keep it separate from *Colchicum*.



Merendera schimperiana

Merendera schimperiana Hochst.

The specific epithet '*schimperiana*' was given in honour of the famous German plant collector, Wilhem George Schimper who had collected plants in Ethiopia between 1837–63, and from whose collection the type was designated. The species was described by Hochstetter in 1842 with the type material collected between Enchet Kab and Schoata in the Gonder floristic region by Schimper. It was also known by the name *M. abyssinica*, described by A. Richard in 1851 from plants collected in the Tekezze Valley and Oudgerate in the Tigray floristic region.

The species is mainly characterised among the other members in the family by its brilliant purple coloured perianth segments and yellow anthers.

Fig. 101.
Merendera
schimperiana,
from Entoto,
Shewa floristic
region.



Description Geophytic herb with a small globose to ovoid corm $1.5\text{--}3.5 \times 1.2\text{--}3$ cm; tunics rigid, brown-black, produced over its neck; underground neck 2–7 cm long, furnished with a cylindrical membranous sheathing leaf. Leaves 2–6, ascending or spreading; leaf-blade linear $4.5\text{--}8.5 \text{ cm} \times 1.5\text{--}5 \text{ mm}$ long. Flowers 1–2, rarely 3 subsessile in the centre of a rosette of leaves. Perianth purple, with a filiform claw, $1.5\text{--}2.5 \text{ cm}$ long and leaf-blade linear oblong $1.7\text{--}3.5 \text{ cm} \times 1.5\text{--}5 \text{ mm}$. Stamens attached to the perianth segments; anthers yellow, linear, almost basifixed, $4\text{--}4.5 \text{ mm}$ long; filaments $3.5\text{--}4 \text{ mm}$ long.

Habitat and distribution The species grows in open grazed grassland, grazed wasteland and open hillside in the montane and ericaceous belt between 2050 and 3880 m in Tigray, Gonder, Gojam, Welo, Shewa, Arsi, Harerge, Bale and Sidamo floristic regions. It also occurs in Somalia and southern Arabia. The main flowering period in Ethiopia is from June to July; the onset of the rainy season in much of highland Ethiopia.

5. IPHIGENIA Kunth

The genus includes slender geophytes. The underground corm is covered with dark thin tunics. The stems are erect or flexuose (flexible). The leaves are sessile, basally sheathing and the leaf-blades are linear to filiform. The flowers are solitary or 3–10, on a lax scorpioid stalk. The pedicels are erect or recurved. The perianth segments are free, deciduous and linear. The stamens have short filaments. The ovary is ovoid and the style very short with 3-falcate stigmatic branches. The capsule is ovoid to cylindrical and opens by loculicidal dehiscence.

The genus is distinguished from other indigenous genera in the family by its erect stems, and by the yellowish, greenish yellow or brownish tepals.

The genus is represented by 15 species distributed in mainland Africa, Madagascar, India, Australia, and New Zealand. Of these, two species are known to occur in Ethiopia.

Key to the species

- | | |
|------------------------|-------------------------|
| 1. Flowers erect | 1. <i>I. pauciflora</i> |
| - Flowers bending down | 2. <i>I. oliveri</i> |



Iphigenia pauciflora

1. *Iphigenia pauciflora* Mart.

The specific epithet '*pauciflora*' refers to the species having few (*pauci-*) flowers (*-flora*). The species was described by Martelli in 1886 with the type material collected from Keren in Eritrea by Beccari. It was also known by the name *I. abyssinica*, described by Chiovenda in 1911 from plants collected in Mai Aini, Tselemti in the border area between Gonder and Tigray floristic regions.

Description

Herb 10–30 cm high. Corm subglobose to ovoid, 0.8–1.5 × 0.8–1.3 cm; tunics brown, muricate. Leaves linear, clasping the stem; leaf-blade 5.5–15 cm × 1–3 mm. Flowers solitary or 2 in the axils of leaves, erect. Pedicel 7–32 mm long. Tepals 6, dark-brown to yellowish to greenish or greenish-yellow, 4–7 × 0.5–0.7 mm. Stamens with filaments 2.5–3.5 mm long; anther 0.5 mm long.

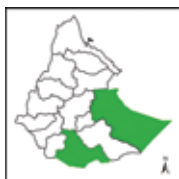
Fig. 102.
Iphigenia pauciflora, from Blue Nile gorge, Shewa floristic region.



Ovary 2.5–3.5 mm long with reduced style and 3-branched stigma. Capsule obovoid to oblong, 8–20 mm long. Seeds many, brown, each ovoid, c. 2×1.5 mm.

Habitat and distribution

The species grows in flat open area in *Euclea-Dodonaea* and in *Acacia-Dichrostachys-Anogeissus* scrub, in open bare land, eroded area of volcanic ash near gulleys with exposed subsoil, and in rocky outcrops in *Acacia-Commiphora-Terminalia* woodland on limestone slopes with sandy soil, between 1250 and 2000 m in Tigray, Shewa, Bale, and Sidamo floristic regions in Ethiopia and in Eritrea. It is otherwise widespread in tropical Africa. The main flowering period is from April to May.



Iphigenia oliveri

2. *Iphigenia oliveri* Engl.

The specific epithet '*oliveri*' was given in honour of Daniel Oliver, British botanist, a Keeper of the Herbarium, RBG, Kew and editor of the Flora of Tropical Africa.

The species was described by Engler in 1893 with the type material collected from Tavetta in Kenya by Johnston.

Description

Herb 20–30 cm high. Corm ovoid, $1.2\text{--}2 \times 0.8\text{--}1.5$ cm; tunic light to dark-brown, slightly muricate. Leaves linear, clasping the stem, alternate; leaf-blade 6.5–17 cm $\times$ 2–5 mm. Flowers solitary in the axils of many leaves, bending down. Pedicel 6–20 mm long. Perianth 6, brown to purple red, 3–12 cm $\times$ 0.5 mm. Stamens 6, filaments 1–1.5 mm long; anthers 0.5 mm long. Ovary with very



Fig. 103.
Iphigenia oliveri,
from Sidamo
floristic region.

short style c. 0.2 mm long and 3-branched stigma. Capsule obovoid to oblong, 7–17 mm long. Seeds many, brown, each $\pm$ globose, 2–3 $\times$ 2–3 mm.

Habitat and distribution The species grows in *Acacia-Commiphora-Terminalia* bushland/woodland, on limestone slopes with sandy soil between 850 and 1650 m in Harerge and Sidamo floristic regions. It also occurs in Somalia, Kenya, and northern Tanzania. The main flowering period in Ethiopia is from April to May; also from October to December.

IRIDACEAE

The family includes perennial evergreen or seasonal herbs with rhizomes, bulbs or corms. The leaves are basal and also along the stem, often distichous and with one leaf clasping the base of the next; the blades are parallel-veined, plane or plicate. The flowering stems are aerial or subterranean, simple or branched, terete, angled or winged. The inflorescence is either composed of umbellate clusters (rhpidia) enclosed in opposite leafy to dry bracts (spathes) with flowers usually pedicellate (to more or less sessile), each subtended by one bract; or a spike of sessile flowers, each subtended by two opposed bracts; or occasionally the flowers are solitary. The flowers are regular or zygomorphic with a petaloid perianth of two equal or unequal whorls (rarely one whorl absent). The tepals are usually large and showy, free almost to the base or united in a tube. The 3 stamens are inserted at the base of the outer tepals, or in the tube with anthers that dehisce longitudinally. The ovary is inferior, 3-locular with few to many ovules; the style is filiform and usually 3-branched or 3-lobed, sometimes simple. The fruit is usually a capsule with a loculicidal dehiscence, rarely indehiscent. The seeds are brownish, globose to angular or discoid, sometimes broadly winged, usually dry, rarely fleshy.

The family is easily distinguished from other lilioid families by the presence of only three stamens and an inferior ovary.

Distribution and classification

The family includes about 70 genera and 1750 species found more or less world-wide. The highest concentration of species is found in southern Africa. The family is represented by 8 indigenous genera and 28 species in Ethiopia.

Economic importance

Members of Iridaceae are of considerable economic importance in horticulture and the cut-flower industry, especially *Iris*, *Gladiolus* and *Freesia*. Several other genera (*Dietes*, *Crocus*, *Watsonia*) are cultivated in

gardens in both tropical and temperate areas. *Moraea* and the southern African *Homeria* are poisonous, and cause significant losses in cattle- and sheep-raising areas, especially in southern Africa. Some genera are of importance in traditional medicine, especially *Gladiolus*. Corms of several species of *Lapeirousia* and *Gladiolus* are eaten locally. The corms of several genera were an important source of food for humans in prehistoric time.

The most commonly found cultivated members of the family in Ethiopia in general, and Addis Ababa in particular, are *Crocasmia* × *crocosmiiiflora* (Lemoine) N.E. Br. (syn. *Montbretia crocosmiiiflora* Lemoine) which grows from a corm and has flattened ribbed leaves and spikes of bright orange flowers, and *Iris* that are probably derivatives of *I. germanica* L. and *I. pallida* Lam. The cultivated irises grow from rhizomes and have flattened, grey-green sword-shaped leaves and white, blue, purple or even brown flowers. These are included in the key to the genera, but not discussed further in the text.

Conservation Among the indigenous species there are a number of endemics, mainly in the genus *Gladiolus*: *G. balensis*, known only from near Ginir in Bale floristic region; *G. negeliensis*, near Negelle in Sidamo floristic region; *G. mensensis*, in a few localities in the highlands of Eritrea; *G. calcicola*, near Harer in Harerge floristic region; *G. longispithaceus*, in Sidamo and Gamo Gofa floristic regions; and *G. lithicola*, near Gara Mulleta in Harerge floristic region. Another endemic species in the family is *Lapeirousia abyssinica*, known in central and northern Ethiopia and in Eritrea. There is an urgent need to protect habitats which are home for these unique treasures.

Key to genera

1. Stamens opposite and adpressed to style branches; style branches broad, flattened, petal-like with paired terminal crests; leaves bifacial and channelled or terete 2
- Stamens alternate or opposite style branches, but never adpressed to them or style not significantly divided; style filiform and simple or terminating in short lobes or filiform branches; leaves unifacial and equitant, sometimes terete or almost so 3

-
2. Tepals united below to form a tube Iris
 - Tepals free 2. Moraea
3. Tepals free to the base; flowers arranged in clusters of 2 or more in
 biseriate whorls, these stalked or sessile; perianth blue, short-lived, open
 in the morning, collapsing spirally and deliquescent in the early afternoon;
 rootstock a rhizome 1. Aristeia
 - Tepals united in a perianth tube, and flowers either solitary per branch, or
 arranged in a spike; perianth variously coloured, lasting at least one full-day
 and fading slowly, not deliquescent; rootstock a corm 4
4. Flowers solitary; leaves linear (nearly filiform), in section oval to round
 with 4-longitudinal grooves, and all inserted below ground; perianth tube
 shorter than tepals 6. Romulea
 - Flowers 2-many, arranged in a spike or panicle; leaves usually with an expanded
 plane blade, some at least inserted above ground level; perianth tube shorter
 or longer than tepals 5
5. Styles dividing at mouth of perianth tube into three long spreading branches.
5. Hesperantha
 - Styles usually well exerted from tube and either simple or dividing remotely
 from tube into 3 branches, these sometimes again divided 6
6. Corms campanulate with a flat base; stems somewhat compressed to angled or
 winged; style branches usually deeply divided 3. Lapeirousia
 - Corms globose to depressed globose with a rounded base; stems round in
 section; style branches simple 7
7. Outer and inner bracts coriaceous, green or dry; leaf midrib consisting of more
 than one pair of veins Crocsmia
 - Outer and inner bracts membranous to scarious, usually translucent to
 transparent with veins often dark coloured; leaf midrib consisting of a single
 pair of veins 8
8. Flowers radially symmetric; perianth pendent and facing the ground; floral
 bracts scarious and translucent with brown streaking; perianth tube shorter
 than tepals 4. Dierama
 - Flowers bilaterally symmetric; perianth usually facing to the side; floral bracts
 green; perianth tube shorter or longer than tepals 9
9. Style simple 7. Zygotritonia
 - Style dividing into 3-branches 8. Gladiolus
-

1. ARISTEA Ait.

The genus is easily distinguished from the other genera in the family by the underground parts being an elongated rhizome, rather than a corm.

The leaves are linear to lanceolate, distichous, crowded at the base of the plant. The stems are rounded to compressed in cross-section, sometimes winged, bearing reduced leaves or leafless. The inflorescences have one to many paired rhipidia (umbellate flower clusters) arranged in panicles or crowded in fascicles on short branches. The bracts are (within spathes) membranous or scarious. The flowers are usually sessile, radially symmetric, blue, each lasting one morning only, perianth twisting spirally on fading. The tepals are basally fused for up to 1 mm, subequal, spreading horizontally. The stamens are erect with oblong anthers. The style is filiform, dividing into 3 short stigmatic lobes at the apex. The capsules are ovoid-ellipsoid to oblong-cylindrical, or 3-lobed.

The genus is represented by about 50 species in sub-Saharan Africa including Madagascar, with the highest diversity in southern Africa. Two species are known to occur in Ethiopia.

Key to the species

1. Flowering stem flattened and 2-winged, leafless except for 1 short subapical leaf or leafy bract; flower clusters 1–2 (rarely 3 or 4) per stem 1. *A. abyssinica*
- Flowering stem rounded to weakly compressed or 2-angled, bearing 2 or more leaves, these not subapical but mostly inserted below middle; flower clusters several (usually more than 3) 2. *A. angolensis*



Aristea abyssinica

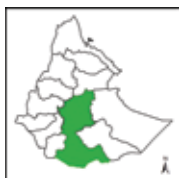
1. *Aristea abyssinica* Pax

The specific epithet '*abyssinica*' refers to the former name of Ethiopia, *Abyssinia*. The species was described by Pax in 1892 from a plant collected in the border area between Tigray and Gonder floristic regions by Schimper. It was also known by the name *A. alata* Baker, which is now a synonym.

The species differs from the next species mainly by the flattened and winged, almost leafless flowering stem, and by usually having only 1–2 flowers.

Description Plant 10–50 cm high. Leaves several, linear to narrowly lanceolate, 2–5(–8) mm wide, usually about half as long as stem. Stem compressed and broadly winged, 2–4 mm wide, unbranched or with a short subapical and often axillary branch. Flower in 1–2(–3), terminal or subterminal clusters, nearly sessile (shortly stalked), 4-flowered. Flowers blue, more or less sessile. Tepals obovate, 10–12 × 6–7 mm. Style *c.* 5 mm long, apex trifid. Capsules ovoid-oblong, 7–9 mm long, more or less sessile or on short pedicels up to 4 mm long.

Habitat and distribution The species grows in short grassland and in edges of forests in highlands, especially on thin, rocky soils, between 1500 and 2800 m in Tigray, Welo, Wellega, Shewa, Arsi, Sidamo, Kefa and Gamo Gofa floristic regions. It also occurs in Kenya, Tanzania, Nigeria, Cameroon, Zaire and south to the eastern Cape, S Africa. The main flowering period in Ethiopia is from July to September.



Aristea angolensis

2. *Aristea angolensis* Bak.

The specific epithet '*angolensis*' refers to the country of origin where the original collection was made, *Angola*. The species was described by Baker in 1898 from a plant collected by *Welwitsch*.

The species differs from the previous species mainly by the round flowering stem, bearing two or more leaves, and by usually having three or more flowers.

Description Plant 25–100 cm high. Leaves several, linear to narrowly lanceolate, 2.5–7(–9) mm wide, mostly basal and about half as long as stem. Stem 2–6 branched (rarely simple), compressed, 2-angled but not winged. Flower clusters 4–14, terminal and axillary, 4–6-flowered; spathes ovate, 9–11 mm long. Flower blue, more or less sessile. Tepals obovate, *c.* 12 × 4–5 mm. Style 6–7 mm long, exceeding anthers, apex 3-lobed. Capsules ovoid-obovoid, 5–7 mm long, subsessile or on pedicels up to 4 mm long.

Habitat and distribution The species grows in well-watered to marshy grassland, sometimes in seepage areas and seasonal marshes between 1800 and 2600 m in Shewa, Arsi and Sidamo floristic regions. It also occurs in Zambia, Zimbabwe, Malawi, South Africa, Angola, Tanzania, Kenya, Nigeria

and western Cameroon. The main flowering period in Ethiopia is from August to October; but sometimes also from May to June.

2. *MORAEA* Miller

The genus is easily recognized from the other indigenous genera by the Iris-like petaloid style branches.

The genus includes perennial herbs with apically rooting tunicate corms. The leaves are several or few, the lower cataphylls (reduced leaves) 2–3, entirely sheathing and membranous. The foliage leaves are usually bifacial and channelled, sometimes terete, inserted on the lower part of the stem. The cauline leaves are shorter or entirely sheathing and bract-like. The stem is simple or branched. The flowers are single or a few together in a rhizidium. The flowers are Iris-like, radially symmetric, usually pedicellate, usually blue or yellow with contrasting nectar guides on the outer tepals. The tepals are free (rarely united), the outer larger, narrowed downwards to a distinct claw; the inner are erect or spreading. The filaments are partly to completely united around the style and the anthers adpressed to the style branches. The style is filiform below, dividing into 3 flat, usually petaloid branches, these diverging and usually forked apically. The capsules are globose to cylindrical.

The genus contains more than 120 species mainly in sub-Saharan Africa, with about 20 species in tropical Africa. Only two species are known to occur in Ethiopia. Several species, particularly in their early stages, are known to be toxic to livestock.

Key to the species

1. Leaves terete (often dry and dead at flowering time); outer tepals 16–24 mm long; seed angular in capsules 8–11 mm long 1. *M. stricta*
 - Leaves bifacial and channelled (often emerging at flowering time); outer tepals 40–65 mm long; seeds flattened and discoid in capsules 30–45 mm long 2. *M. schimperi*
-

*Moraea stricta*

1. *Moraea stricta* Bak.

The specific epithet '*stricta*' refers to the upright erect stem. The species was described by Baker in 1904 from a plant collected in Africa. It was also known by the name *M. tellinii*, described by Chiovenda in 1911 from a plant collected in Gonder floristic region.

The species is distinguished from the next species by the more or less sessile lateral branches, cylindrical leaves and small blue-violet flowers with outer tepals 19–24 mm long.

Description

Perennial plants, 15–25 cm high. Corm 1–3 cm in diameter. Leaf solitary, usually absent during the flowering period, or the old one still attached to base of stem), the new emerging leaf will grow to about 60 cm long, $\pm$ terete and 1.5 mm thick. Stem erect, usually bearing 3–6 branches, that are held close to the main stem. Spathe dry and papery, rarely green near base, inner (2.5–)3–4 cm long. Flowers pale lilac to blue-violet with yellow-orange spotted nectar guides on outer tepals; outer tepal 19–24 mm long, claw ascending, narrow; inner tepals linear-lanceolate, erect or ascending, 15–18 $\times$ 2–4 mm. Style branches 7–8 mm long, diverging about 1.5 mm above base. Capsules obovoid, (8–)9–11 mm long.

Habitat and distribution

The species grows in open stony grassland, between 1500 and 1950 m in Arsi, Sidamo and Harerge floristic regions. It is also widespread in Africa, from Ethiopia to the eastern Cape, South Africa. The flowering period in Ethiopia is from October to November, also from January to March.

*Moraea schimperii*

2. *Moraea schimperii* (Hochst.) Pic. Serm.

The specific epithet '*schimperii*' was given in honour of the famous German collector, George Wilhem Schimper, from whose collection the type of the species was designated. The species was described by Hochstetter in 1844 as *Hymenostigma schimperii* from a plant collected from Mt. Bachit in Gonder floristic region. The name was later transferred to the genus *Moraea* by Pichi-Sermolli in 1950.

The species is clearly distinguished from *M. stricta* by the unbranched stem, channelled bifacial leaves and blue-purple flowers with outer tepals 40–65 mm long.



Fig. 104. *Moraea schimperi*, from Arsi floristic region.

Description Plant medium to large, 20–50 cm high, solitary or sometimes growing in clumps. Corm about 1.5–2 cm in diameter, with brown firm-textured tunics covered by cataphylls. Leaf solitary, linear, initially shorter than stem, 9–15 mm wide, channelled below, flat above, eventually much exceeding stem. Stem erect, unbranched. Spathes dry and often brown, attenuate, inner (6–)7–10(–12) cm long, outer 2–3 cm shorter than inner. Flowers blue-purple with yellow nectar guides on outer tepals; outer tepals lanceolate, 40–65 mm long, spreading to slightly reflexed; inner tepals erect, lanceolate, 3.5–4.5 cm long. Style branches 15–20 mm long, crests 10–20 mm long. Capsules 25–35 mm long, cylindrical.

Habitat and distribution The species grows in montane grassland and woodland between 1570 and 3250 m in Gonder, Shewa, Arsi, Wellega, Kefa, Sidamo, Bale, and Harerge floristic regions. It is also widespread in the Sudan, highlands of eastern tropical Africa, Angola, Cameroon, and Nigeria. The flowering period in Ethiopia is from January to March.

3. LAPEIROUSIA *Pourret*

The genus is easily recognised from the other indigenous genera by the bell-shaped, flat-bottomed corms with dense and fibrous tunics.

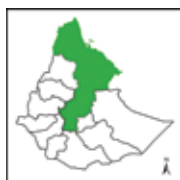
The genus includes perennial herbs. The lower leaves (cataphylls) are membranous and with sheathing base;

the foliage leaves are few, sometimes solitary, lowermost longest and inserted on the stem near the ground level. The cauline leaves are successively smaller. The stem is somewhat compressed and angular. The inflorescence is either panicle-like, or a simple to branched spike or the flowers are clustered at ground level. The flowers are blue, purple, red, white or pink, radially or bilaterally symmetric, tube short to long, tepals subequal or unequal. The style is filiform, usually forking for up to half its length, but sometimes entire or barely bifid. The capsules are membranous to coriaceous, and more or less globose.

The genus contains *c.* 40 species, widespread across sub-Saharan Africa, from SW Cape to Nigeria and Ethiopia. Two species are known to occur in Ethiopia.

Key to the species

1. Flowers blue-violet with darker nectar guides on lower tepals; perianth tube 7–10 mm long 1. *L. abyssinica*
 - Flowers white and lacking nectar guides; perianth tube 70–160 mm long 2. *L. schimperii*
-



*Lapeirousia
abyssinica*

1. *Lapeirousia abyssinica* (R. Br. ex A. Rich.) *Baker*

The specific epithet '*abyssinica*' refers to the former name of Ethiopia, *Abyssinia*, where the original collection was made. The species was previously coined by Robert Brown and described later by A. Richard in 1850 as *Geissorhiza abyssinica* from a plant collected from Maigigoi in the Tigray floristic region by Quartin-Dillon and Petit. The name was transferred to the genus *Lapeirousia* by Baker in 1878.

The species is clearly distinguished from *L. schimperii* by the blue-violet flowers with a perianth tube that is *c.* 7–10 mm long.

Description

Plant generally small, 9–15 cm high, sometimes to 35 cm, sparsely branched. Corm 8–12 mm in diameter. Cataphylls 2, inner pale and membranous, reaching shortly above ground, outer shorter and dark-brown. Leaves 3, lower 2 at least usually inserted near ground

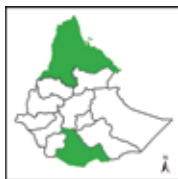
Fig. 105.
Lapeirousia
abyssinica, from
Welo floristic
region.



level, lowermost longest and about as long as, to slightly exceeding, the inflorescence, lanceolate, 3–5 mm wide. Stem compressed, 2–3-angled, sometimes narrowly winged. Inflorescence a spike or few-branched pseudopanicule, main axis 5–7-flowered, secondary axes with fewer flowers. Flower bilaterally symmetric, violet, lower three tepals each with a white median line edged with a darker band of purple in the lower mid-line; perianth tube more or less straight, narrowly funnel-shaped, 7–9 mm long. Tepals unequal, lanceolate, lower three horizontal to descending, held close together and forming a lip, $c. 9 \times$ up to 2 mm, upper three larger, dorsal more or less erect, upper laterals reflexed, $c. 9 \times$ up to 3 mm. Style dividing between middle and apex of anthers, branches $c. 2$ mm long. Capsules globose-trigonous, 3–4 mm long, showing outline of seeds.

Habitat and distribution

The species grows in rocky places, in shallow soils, often on lime-stone, between 1800 and 2600 m in Tigray, Welo, Gojam, and Shewa floristic regions in Ethiopia and in Eritrea. It is not known elsewhere, except possibly in the Sudan. The main flowering period is from July to August.



Lapeirousia
schimperi

2. *Lapeirousia schimperi* (Asch. & Klatt) Milne-Redhead

The specific epithet '*schimperi*' was given in honour of the famous German collector, George Wilhem Schimper from whose collection the type of the species was designated. The species was described by Ascherson and Klatt in 1866 as *Tritonia schimperi* from a plant collected in Tekeze in Tigray floristic region. The name was later transferred to the genus *Aristea* by Milne-Redhead in 1934.

The species is clearly distinguished from the previous species by the white flowers with a very long perianth tube, 70–160 mm long.

Fig. 106.
Lapeirousia
schimperi, from
south of Wachile,
Sidamo floristic
region.



Description

Plant (20–)30–80 cm high, usually with several branches. Corm 18–22 mm in diameter at base, tunics composed of compacted fibres, light to dark brown, outer layers becoming loosely fibrous and reticulate. Leaves linear, 3 or more, lower 2 largest and usually slightly longer than inflorescence, decreasing in size and becoming bract-like upwards, narrowly lanceolate, 5–10(–15) mm wide, midrib slightly raised. Stem rounded to nearly square below, and 4-angled to 4-winged above. Inflorescence a lax pseudo-panicle, ultimate branches with 1–3 sessile flowers. Flowers bilaterally symmetric, white to cream, rarely pale violet, when whitish sometimes fading or drying lilac especially on the tube, opening in the evening, then sometimes scented; perianth tube cylindrical, slender, 7–16 cm long; tepals lanceolate, extended more or less at right angles to tube, 8–11 × 6–7 mm. Style branches c. 2 mm long, forked for c. 1/3 their length. Capsules obovoid-oblong, 8–12 mm long, partly enclosed in bracts.

Habitat and distribution

The species grows in moist habitats in arid areas, stream sides and seasonal marshes as well as in damp grassland between 1200 and 2150 m in Tigray, Gonder and Sidamo floristic regions in Ethiopia and in Eritrea. It also occurs in Kenya, Sudan, Tanzania, southern Zambia, Zimbabwe, possibly Malawi, Angola, Namibia, and northern Botswana. The main flowering period in Ethiopia is from May to August.

4. DIERAMA K. Koch

The genus is easily recognised from the other indigenous genera by the wiry, usually drooping spikes, and the pendent, radially symmetric flowers.

The genus includes evergreen perennials with large persistent corms with coarsely fibrous tunics. The leaves are several; the lower cataphylls are 2–3, sheathing the base, often dry and becoming fibrous; the foliage leaves are linear, plane, fibrous, often without a midrib. The stem is terete, slender and wiry, usually branched. The inflorescence is a spike. The axes are wiry, usually drooping, but sometimes erect. The bracts are scarious, solid or sometimes membranous, if so then often translucent, lacerate above and usually brown-streaked or veined. The flowers are usually pink (also red, purple, yellow or white), radially symmetric, usually pendent and campanulate, with a fairly short funnel-shaped tube. The tepals are subequal. The style is exserted from tube, seldom from the perianth, and the branches are simple, short and filiform. The capsules are globose and coriaceous. The seeds are globose or slightly angled, hard, smooth and often shiny.

The genus contains *c.* 44 species that extend from the eastern Cape in South Africa through east tropical Africa to Ethiopia. Most species are concentrated in southern Africa. Only one species is known in Ethiopia.



Dierama cupuliflorum

Dierama cupuliflorum Klatt

The specific epithet '*cupuliflorum*' refers to the cup (*cupula*) shaped (*-florum*) flower.

The species was described by Klatt in 1879 from a plant collected in Kilimanjaro, Tanzania by Decken and Kersten.

Description

Plant in clumps of few to many stems. Corms 10–20 (–25) mm in diameter. Leaves several, basal 20–85 × 0.4–0.7 (–1.1) cm. Stems 0.3–1–3.5 m long, 2–4-branched. Spikes pendulous, terminal 2–6 (–7)-flowered, lateral spikes 2–4 (–5)-flowered, flowers usually laxly arranged. Flower 18–30 mm long; tepals 12–15 × 4.5–9 mm. Anthers 5–7.5 mm long. Stigmas reaching to 3–6 mm below tepal apices. Ovary ovoid, *c.* 4 mm long; style reaching to anther apices or shortly beyond them, and 3–4 mm short of tepal apices. Capsules globose, 6–8 mm long.

Habitat and distribution

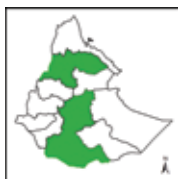
It grows in grassland and heath between 2000 and 3500 m in Arsi and Bale floristic regions. It also occurs in Kenya, Tanzania, Uganda and Malawi. The main flowering period in Ethiopia is from October to December, sometimes also from May to June.

5. HESPERANTHA *Ker Gawl.*

The genus is distinguished from other indigenous genera by the radially symmetric perianth, by the style dividing at the mouth of the perianth tube into long and spreading branches, and by having the stigmatic surface spread along the entire length of the style branches.

The genus includes perennial herbs with small corms with woody to leathery tunics. The leaves are few to several; the lower cataphylls 2–3, membranaceous and entirely sheathing; the foliage leaves lanceolate to linear (rarely terete). The blades are plane or sometimes with raised margins and midrib. The stem is simple or occasionally branched. The inflorescence is a spike. The flowers are radially symmetric, usually white or pink and frequently closed in the day and opening in the evening. The tepals are united in a cylindrical or curved tube, subequal, spread horizontally or cupped. The style is usually dividing at the mouth of the tube, and the branches are long and spreading with the stigmatic surfaces along their entire length. The capsules are broadly ovoid to cylindrical, sometimes dehiscent only in the upper third.

The genus contains *c.* 65 species in sub-Saharan Africa, mainly in the Drakensberg and the Cape in South Africa. Only 3 species are known in tropical Africa, and of these only the following species occur in Ethiopia.



*Hesperantha
petitiana*

***Hesperantha petitiana* (A. Rich.) Baker**

The specific epithet '*petitiana*' was given in honour of the French collector, Antoine Petit from whose collection the type of the species was designated. The species was described by A. Richard in 1850 as *Ixia petitiana* from a plant collected near Maigougua in Tigray floristic region by Quartin-Dillon and Petit. The name was later transferred to the genus *Hesperantha* by Baker in 1878.

Description Plant 8–30(–45) cm high. Corm globose to ovoid, 7–12 mm in diameter, tunics dark brown, woody to somewhat membranaceous, concentric. Leaves 3–4, lower 2(–3) basal and longest, 2–6 mm wide, about half to two-thirds as long as stem, margins and midrib usually lightly thickened; upper leaf inserted in the middle of the stem, short and usually entirely sheathing. Stem erect, very occasionally branched. Spike (1–)2–6(9–)-flowered; bracts (9–)12–15 mm long. Flowers pink, lilac or white; perianth tube 6–9 mm long, cylindrical and straight. Tepals (9–)12–18 mm long, ovate-elliptic, 5–7 mm wide, outer often flushed darker on the back side. Filaments 3–4 mm long; anthers (3–)4–7.5 mm long. Style branches 6 mm long. Capsules oblong-ellipsoid, 10–15 mm long.

Habitat and distribution It grows on rocky sites and short grassland, open hillsides with some low scrub, often on cliffs and rock outcrops between 2300 and 4100 m in Tigray, Gonder, Shewa, Arsi, Gamo Gofa, Sidamo, and Bale floristic regions. It also occurs in the Sudan, Kenya, Uganda, Tanzania, Cameroon, Zimbabwe, and Malawi. The main flowering period in Ethiopia is from August to October.

6. *ROMULEA Maratti*

The genus is distinguished from other indigenous genera by the leaves which are terete to oval in transverse section and have narrow, longitudinal grooves. The flowers are solitary and radially symmetric.

The genus includes perennials with small, globose corms with woody to cartilaginous or papery tunics. The leaves are few to several; the lower cataphylls are 2–3, entirely sheathing, membranaceous or firm and green; the foliage leaves are all basal, one to several, linear to more or less filiform with two narrow longitudinal grooves on each surface, oval to terete in transverse section. The stem is simple or branched, branching usually below ground. The flowers are solitary and radially symmetric, cupulate, variously coloured, often yellow in their centre. The style is dividing at or above the level of the anthers, and the stylar branches are short, usually divided for half their length. The capsules are oblong.

The genus contains *c.* 95 species which are distributed in southern and tropical Africa, southern Europe and the Mediterranean region. Its main concentration is in South Africa, with a secondary centre in the Mediterranean Basin and Middle East. Three species are known to occur in Ethiopia, one of them also in Eritrea.

Key to the species

1. Inner floral bracts rust-coloured and entirely membranaceous to scarious; peduncles comparatively thick, 1–1.3 mm in diameter **3. *R. congoensis***
- Inner floral bracts entirely green or with narrow to broad scarious margins, these wither transparent or streaked with brown; pedicels 0.6–1 mm in diameter **2**
2. Inner floral bracts with a broad scarious margin irregularly streaked with brown; perianth tube 4–5 mm long **1. *R. fischeri***
- Inner floral bracts green, or with pale narrow membranaceous margins; perianth tube 7–8 mm long **2. *R. camerooniana***



Romulea fischeri

1. *Romulea fischeri* Pax

The specific epithet '*fischeri*' was given in honour of the collector, Fischer from whose collection the type of the species was designated. The species was described by Pax in 1892 from a plant collected in the Aberdare mountains, Kenya.

The species is related to the eastern and southern African *R. camerooniana*, and difficult to separate from that species, but in *R. fischeri* the inner bracts have a broad scarious margin irregularly streaked with brown. In contrast *R. camerooniana* has pale green inner bracts, without brown streaks.



Fig. 107.
Romulea fischeri,
from near Addis
Ababa, Shewa
floristic region.

Description

Plant (1–)7–12 cm high excluding leaves. Corm globose, tapering below to an oblique rounded base, 7–10 mm in diameter, tunics woody or cartilaginous, red-brown. Foliage leaves (2–)3–5, mostly 8–15 mm long, oblong in transverse section. Flowering stems 1–4 per plant, more or less erect, becoming slightly falcate after anthesis. Outer bracts green, usually with narrow membranous margins, inner bracts with broad scarious margins streaked with brown, 12–18 mm long, as long as or slightly shorter than the outer. Flowers blue, purple, or violet, occasionally almost white, yellow in the centre, tepals with bands of darker pigment over 3 main veins, particularly so on reverse; perianth tube 4–5 mm long; tepals lanceolate, erect below, curving outwards above, $10\text{--}16 \times 3\text{--}4$ mm. Style dividing between the upper third and apex of the anthers, branches *c.* 1.5 mm long, usually arching outward shortly above anther apices, occasionally exceeding anthers by 2–3 mm. Capsules ovoid-oblong, 7–10 mm long.

Habitat and distribution

This species grows on rocky sites, along track, often in heavily grazed grassland between 2200 and 4200 m. It is widespread in Ethiopia and Eritrea. It also occurs in the Sudan, Somalia, Kenya, Uganda, and Saudi Arabia. The main flowering period in Ethiopia is from August to October.



*Romulea
camerooniana*

2. *Romulea camerooniana* Baker

The specific epithet '*camerooniana*' refers to the country of origin where the collection was made, *Cameroon*. The species was described by Baker in 1876 from a plant collected from Mt. Cameroon by Mann.

The species is related to *R. fischeri* and difficult to distinguish from that species, but in this species the inner bracts are green, or with pale narrow membranous margins. In *R. fischeri*, the inner bracts have irregularly brown streaks.

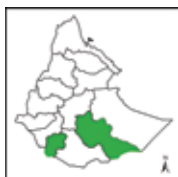
Description

Plant 5–8 cm high excluding leaves. Corm ovoid, tapering below to a blunt point, 8–15 mm in diameter, tunics woody or cartilaginous, red-brown, usually extending upward in a fibrous neck around base of stem. Foliage leaves 2(–3) plus one more for each additional flowering stem, oval in transverse section usually straight. Flowering stems 1–4 per plant, more or less erect. Outer bracts green and lightly striate, 12–18 mm long, inner bracts similar or often with narrow membranaceous margins, as long as or slightly shorter than outer. Flowers blue, purple, or violet, yellow in centre, tepals with darker bands of pigment over 3 main veins, particularly so on the reverse; perianth tube 7–8 mm long. Style dividing opposite upper

third of anthers, branches *c.* 1 mm long, usually arching shortly above anther apices, occasionally substantially exceeding anthers. Capsules ovoid-oblong, 7–10 mm long.

Habitat and distribution

It grows on rocky outcrops with volcanic boulders between 1950 and 2400 m in Bale and Sidamo floristic regions. It also occurs from Kenya to S. Africa, and in Cameroon and the Sudan. The main common flowering period in Ethiopia is from April to June.



Romulea congoensis

3. *Romulea congoensis* Bég.

The specific epithet '*congoensis*' refers to the country of origin where the collection was made, *Congo*. The species was described by Béguinot in 1938.

The species is clearly distinguished from the previous two species by the rust-coloured inner floral bracts. It was also known by the name *R. keniensis*, which is now a synonym.

Description

Plant 2–5(–10) cm high including leaves. Corm depressed-globose, 5–9 mm in diameter, tunics membranous, reddish brown. Leaves 3–5(–7), linear, usually arcuate, oval in transverse section with 4 narrow longitudinal grooves, 1–1.3 mm wide, midrib evident without a central hyaline ridge. Flowering stems 1–2 per plant, more or less erect at anthesis, soon curving outward, sharply so in fruit, 1–1.3 mm in diameter; bracts 12–15 mm long, outer green with broad mem-branaceous margins, inner bracts entirely mem-branaceous to scarious, slightly short than outer. Flowers blue to white, with a white to yellow centre; perianth tube funnel-shaped, *c.* 7.5 mm long; tepals lanceolate, erect below, patent in upper half, 15–20 × *c.* 6 mm. Filaments 5–6 mm long; anthers *c.* 6 mm long. Ovary oblong, *c.* 3 mm long; style reaching to about middle of anthers, branches not exceeding anther apices. Capsules ovate, *c.* 10 mm long, usually pendent (erect when pedicel not reaching above ground).

Habitat and distribution

It grows on rocky places between 3300 and 4100 m in Arsi, Bale and Gamo Gofa floristic regions. It also occurs in Kenya, Uganda, and Democratic Republic of Congo (Zaire). The main flowering period in Ethiopia is from August to October.

7. ZYGOTRITONIA *Mildbr.*

This genus is easily recognised within the family in Ethiopia by its small white flowers and the undivided style.

The genus includes small seasonal herbs with corms. The leaves are few, lanceolate to linear, prominently nerved to somewhat plicate. The stem is flattened, simple or branched. The inflorescence is a spike with spirally arranged flowers. The bracts are small, green, drying brown. The flowers are yellow, orange or white, and bilaterally symmetric. The tepals are united to form a cylindric tube; unequal, upper larger held apart and hooded, lower three forming a lip. The stamens are arcuate. The style is slender and simple (undivided). The capsule is three-lobed. The seeds are globose to angled and smooth on the surface.

The genus is represented by four species, all in tropical Africa. Of these, only the following species is known to occur in Ethiopia.



Zygotritonia praecox

Zygotritonia praecox Stapf

The specific epithet '*praecox*' refers to the sequence in the development of the flowers and the leaves, in this case referring to the development of flowers before the leaves (*praecox*). The species was described by Stapf in 1927 from a plant collected from Abinsi, Nigeria by Dalziel.

Description

Plants 15–25 cm high. Corm 12–22 mm in diameter. Leaves hysteranthous, flowering stem bearing two small leaves, one basal and sheathing two-third of the stem, reaching to about the base of the spike, the upper leaf (when present) as long as or shorter than the lower and inserted in the third; the lower leaf with linear to lanceolate leaf blade, 3–12 cm long, 1–5 mm wide. Stem simple or with 1–2 branches. Spike with 8–24 flowers on the main axis, 5–12 on the branches. Flowers whitish, flushed pink on the tube and at the end of the tepals, especially the upper; perianth tube 2.5–3 mm long; tepals linear to lanceolate, the upper 5–8 mm long, the other tepals 3–4 mm long. Filaments 3–4 mm long. Capsule 3 mm long and 3–4 mm wide, dark brown slightly warty.

Habitat and distribution

The species grows in dense stands in bushland meadows with rocky outcrops, between 1600 and 1620 m, near Assosa in Wellega floristic region. The species is otherwise



Fig. 108.
*Zygotritonia
praecox*, from
near Assosa,
Wellega floristic
region.

known from Senegal, Guinea, Mali, Nigeria, and in the Central African Republic. The recent collection in western Ethiopia represents a large extension eastwards. The main flowering period in Ethiopia is from May to July.

8. GLADIOLUS L.

The genus is easily recognised in Ethiopia within the family by its large conspicuous bilaterally symmetrical flowers.

The genus includes perennial herbs with corms. The

leaves are few to several, usually contemporary with flowers (or developing after flowering and borne on separate shoots), basal or cauline; the blades are well developed or reduced and largely to entirely sheathing, lanceolate to linear and plane. The stem is terete, simple or branched. The inflorescence is a one sided spike. The bracts are usually green, soft to firm, sometimes dry and brown at anthesis, relatively large, inner usually smaller than outer. The flowers are bilaterally symmetric. The tepals are united in a well-developed, sometimes very long tube, subequal to unequal, the dorsal is broader and arching over stamens, the lower are narrower than the dorsal. The filaments are arcuate, included or exerted from the tube. The style is exerted and the branches are simple. The capsules are large and slightly inflated. The seeds are usually many, with a broad membranous wing (wingless in a few species).

The genus includes *c.* 250 species, centred mainly in southern Africa and extending through tropical Africa and Madagascar, with a few species in Europe and the Middle East. Of these, 16 species are known to occur in Ethiopia. Six species are endemic in Ethiopia and Eritrea.

Key to the species

1. Perianth tube about twice as long as tepals (or longer), exceeding bracts (and at least 50 mm long); flowers white to cream, with or without red to purple marks on lower tepals 2
 - Perianth tube shorter to slightly longer than both upper tepal and bracts (never twice as long); flowers variously coloured including white or cream 4
2. Lower tepals splashed with dark purple in lower half, and anthers with acute apiculate appendages 15. *G. murielae*
 - Lower tepals not marked with contrasting colours; anthers either with acute apiculate appendages or with rounded apices 3
3. Anthers with acute apiculate appendages 16. *G. candidus*
 - Anthers with obtuse apices (without apiculate apices) 9. *G. gunnisii*
4. Dorsal tepal 2–3 times as long as other tepals and twice as long as wide 5
 - Dorsal tepal up to 1.5 times as long as other tepals and usually less than twice as long as wide 6
5. Bracts 35–70 mm, usually red or purple; dorsal tepal 20–40 mm 11. *G. abyssinicus*

- Bracts 18–24(–30) mm, usually dull purple; dorsal tepal 12–18(–22) mm
12. *G. schweinfurthii*
- 6. Flowers fairly large, 55–95 mm long; perianth tube 30–45 mm long 7
- Flowers of moderate size, 25–45(–54) mm long; perianth tube 12–25(–30) mm long 10
- 7. Lower tepals half to a third as long as dorsal 8
- Lower tepals about as long or not much shorter than dorsal 9
- 8. Flowers predominantly red; perianth tube comprising a slender lower part, 20–25 mm long, abruptly expanded into a wide horizontal cylindrical upper part c. 15 mm long; dorsal tepal extended forward horizontally
10. *G. longispathaceus*
- Flowers orange, yellow or sometimes brownish; perianth tube not abruptly expanded above into a wide cylindrical upper part, gradually expanding above and narrowly and obliquely funnel-shaped; dorsal tepal hooded over stamens and concealing them
6. *G. dalenii*
- 9. Plant with only 2–3 foliage leaves on stem; floral bracts 20–27(–35) mm long; tepals uniformly pale
3. *G. negeliensis*
- Plant with (3–)4–5 foliage leaves; floral bracts (35–)40–60 mm long; tepals each with a prominent central stripe
8. *G. pauciflorus*
- 10. Flowering stem lacking long-bladed foliage leaves, these produced on separate shoots after flowering has begun; flowers white to pale pink
7. *G. roseolus*
- Flowering stem with foliage leaves present at flowering time; flowers with various colours, including white and pale pink 11
- 11. Flowers 25–35 mm long 12
- Flowers 36–54 mm long 13
- 12. Perianth tube c. 12 mm long; bracts 20–25(–30) mm long; anther apices obtuse, without appendages
5. *G. calcicola*
- Perianth tube c. 15 mm long; bracts 14–20(–25) mm long; anther apices with short acute apiculate appendages
3. *G. mensensis*
- 13. Perianth tube about half as long as dorsal tepal, and c. 15 mm long
4. *G. boranensis*
- Perianth tube about as long as dorsal tepal and at least 16 mm long 14
- 14. Flower red or pink and with broad longitudinal cream or white nectar guides on lower tepals; anthers with acute apiculate appendages c. 1 mm long
13. *G. sudanicus*
- Flower shades of white or pink, but then without longitudinal pale markings on lower tepals; anthers without pale acute apiculate appendages 15

15. Flower more than 45 mm long
 - Flower 36–42 mm long

8. *G. pauciflorus*
 16

16. Perianth white, lower lateral tepals with yellow to greenish transverse blotches; erect plant of open grassland or light woodland 1. *G. balensis*
 - Perianth pink, lower tepals evidently without markings; plant of rock outcrops and cliffs, usually hanging downward 14. *G. lithicola*



Gladiolus balensis

1. *Gladiolus balensis* Goldblatt

The specific epithet '*balensis*' refers to the floristic region where the original collection was made, Bale. The species was described by Goldblatt in 1996 from plants collected near Ginir by Gilbert, Ensermu K., and Vollesen.

The species is easily distinguished from other indigenous species by the slender habit and white flowers with usually pink marks in the upper lateral tepals and yellowish in the lower ones.

Description

Plant 50–60 cm high. Corm 18–22 mm in diameter. Foliage leaves 3, only lower most basal, this longer, upper 2 leaves inserted above ground level and shorter than the basal, blades narrowly lanceolate to linear. Stem erect, unbranched, 2–3 mm in diameter at the base of the spike. Spike 5–9-flowered, straight and erect. Flowers white, usually pink in midline of upper lateral tepals and flushed pink on fading; perianth tube 18–20 mm long, expanded in upper 5 mm; tepals unequal, dorsal longer and arched over stamens, broadly lanceolate, c. 22 × 15 mm, upper laterals slightly smaller, lower 3 tepals c. 24 mm long, lower laterals 6–7 mm wide, lower median c. 10 mm wide. Filaments c. 14 mm long, exerted 4–5 mm from the tube. Style dividing just beyond anther apices, branches extending well past anthers, 3–4 mm long. Capsules and seeds unknown.



Fig. 109.
Gladiolus balensis, from near Ginir, Bale floristic region.

Habitat and distribution

It grows on rocky basalt outcrops in grass on mountain slopes and on limestone escarpment in *Acacia-Combretum* woodland between 1750 and 1850 m in Bale floristic region in southeastern Ethiopia. It is not known anywhere else. The main flowering period is from May to June.



Gladiolus negeliensis

2. *Gladiolus negeliensis* Goldblatt

The specific epithet '*negeliensis*' refers to the place where the original collection was made, *Negeli* (*Negelle*). The species was described by Goldblatt in 1996 from a plant collected from south of Negelle on the road to Melka Guba, in Sidamo floristic region, Ethiopia by Friis, Mesfin T., and Vollesen.

The species is easily distinguished from other indigenous species by the slender habit and moderate sized 15–30 mm long, white to pale pink flowers.

Description

Plant 15–30 cm high. Corm 10–15 mm in diameter. Foliage leaves usually 3 (or less), all basal or upper inserted on lower part of stem, blades narrowly lanceolate to linear, reaching to about middle of stem. Stem unbranched, generally flexed outward at base of spike or above sheath of upper leaf, 1.5–2 mm in diameter at the base of the spike. Spike 2–5-flowered. Flowers white to pale pink, tepals each with a medium pink streak and lower 3 with greenish to yellow markings, throat often streaked with pink; perianth tube 30–40 mm long, obliquely funnel-shaped, narrow part 25–30 mm long and reaching or exceeding apices of bracts; tepals lanceolate, dorsal



Fig. 110.
Gladiolus negeliensis, from near Negelle, Sidamo floristic region.

25–28 × 10–12 mm, lower 3 tepals 25–27 × 8–10 mm. Filaments 8–10 mm long, exserted 4–5 mm from tube. Style dividing near anther apices, or sometimes beyond them, branches 4–5 mm long, spreading beyond anthers. Capsules and seeds unknown.

Habitat and distribution

It grows on open flat grassland, sometimes waterlogged in the rainy season between 1500 and 1700 m in Sidamo floristic region, southern Ethiopia. It is not known anywhere else. The main flowering period is from May to June.



Gladiolus mensensis

3. *Gladiolus mensensis* (Schweinf.) Goldblatt

The specific epithet '*mensensis*' refers to the locality where the original collection was made, *Mensa*. The species was described by Schweinfurth in 1894 as *Tritonia mensensis* from plants collected in Eritrea by Schweinfurth. The name was later transferred to the genus *Gladiolus* in 1996 by Goldblatt.

The species is distinguished from the similar species, *G. calcicola* by its comparatively longer perianth tube (c. 15 mm long) in contrast to the shorter (c. 12 mm long) in *G. calcicola*.

Description

Plant 25–50(–80) cm high. Corm 12–14 mm in diameter. Foliage leaves 4–5, lower 2–3 more or less basal, seldom reaching beyond middle of spike, blades linear, 2–4 mm wide, upper 2 or 3 leaves much shorter than basal and largely to entirely sheathing. Stem erect, unbranched, c. 2 mm in diameter at base of spike. Spike 4–7-flowered, erect. Flowers pink or white; perianth tube c. 15 mm long, obliquely funnel-shaped; tepals more or less equal, possibly dorsal slightly larger, 18–20 mm long, c. 8 mm wide, their orientation uncertain. Filaments 9–12 mm long, exserted 4–5 mm from tube. Style arched over stamens, dividing just beyond anther apices, branches c. 2.5 mm long. Capsules obovoid ellipsoid, c. 13 mm long.

Habitat and distribution

It grows on rocky grassland at c. 2200 m near Gheleb in Eritrea. It is not known anywhere else. The main flowering period is in April.

This is a poorly known species and additional collections are needed.

*Gladiolus boranensis*

4. *Gladiolus boranensis* Goldblatt

The specific epithet '*boranensis*' refers to the region where the original collection was made, *Borana*. The species was described by Goldblatt in 1996 from a plant collected from Mega, in Sidamo floristic region by Mooney.

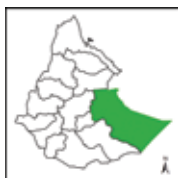
The species is distinguished from the related species, *G. mensensis* and *G. calcicola* by its larger flowers (36–55 mm long) in contrast to the smaller (less than 35 mm long) in the other two.

Description

Plant 38–55 cm high. Corm 18–20 mm in diameter. Foliage leaves 6–7, lower 3–4 basal and longest, usually exceeding spike by 5–15 cm, blades linear, 2–4(–6) mm wide, midrib and margins moderately thickened, upper (1–2)2–3 leaves short and largely to entirely sheathing, usually without blades. Stem erect, unbranched, 2–3 mm in diameter at base of spike. Spike 5–10-flowered, straight and erect. Flowers pale to deep pink, pale in the throat and toward bases of lower tepals; perianth tube *c.* 15 mm long, obliquely funnel-shaped; tepals apparently nearly equal or dorsal slightly larger, 24–32 × 15 mm, lower 3 tepals 24–30 × *c.* 13 mm. Filaments 12–15 mm long, exerted *c.* 5 mm from tube. Style arching over stamens, dividing near anther apices, branches *c.* 4 mm long. Capsules and seeds unknown.

Habitat and distribution

It grows in *Juniperus* forest and *Commiphora* scrub, sometimes in rocky sites; between 1800 and 2400 m near Mega in Sidamo floristic region. It also occurs in Kenya. The main flowering period in Ethiopia is from September to October.

*Gladiolus calcicola*

5. *Gladiolus calcicola* Goldblatt

The specific epithet '*calcicola*' refers to the habitat on which the species grows on calcareous slopes, literally meaning, calcium (*calci*) dwelling (*-cola*). The species was described by Goldblatt in 1996 from a plant collected in an area south of Harar, in Harerge floristic region, Ethiopia by de Wilde.

The species is distinguished from the similar species, *G. mensensis*, known only from Eritrea, by its comparatively shorter perianth tube (*c.* 12 mm long) in contrast to the longer (*c.* 15 mm long) in *G. mensensis*.

Description Plant 30–70 cm high. Corm 10–16 mm in diameter. Foliage leaves 5–6, lower longest and reaching base of spike, eventually (after flowering) about as long as spikes, linear, (2–)3–5 mm wide. Stem erect, rarely with 1 short branch, 2–3 mm in diameter at base of spike. Spike 2–4(–7)-flowered. Flowers pale salmon pink, tepals darker along midline; perianth tube c. 12 mm long, curving outward and widening above; tepals subequal, 16–18 mm long (often shorter when dry), narrowly lanceolate, straight and directed forward. Filaments 11–12 mm long, exserted c. 3 mm from tube. Style arching over stamens, dividing opposite middle of anthers, branches c. 3 mm long, not reaching anther apices. Capsules ellipsoid, 17–22 mm long.

Habitat and distribution It grows on stony limestone soils at c. 2000 m in Harerge floristic region and is not known from anywhere else. The main flowering period is from September to November.

6. *Gladiolus dalenii* van Geel

The specific epithet '*dalenii*' refers to the Dutch Botanist, Cornelius Dalen, who was associated with the Rotterdam Botanic Garden and responsible for the introduction of the species from Natal, South Africa in cultivation.

The species is easily recognised by the large showy yellow, orange to deep red flowers with the upper three tepals 35–50 mm long, much exceeding the lower tepals.

Two subspecies are recognised. *G. dalenii* subsp. *dalenii* and subsp. *andongensis*. The latter can be confused with *G. sudanicus* which also has red flowers. However, the subspecies has longer perianth tube (25–) 35–45 in contrast to the 16–20 mm long perianth tube in *G. sudanicus*. *G. dalenii* subsp. *dalenii* has large yellowish flowers.

Description Plant 50–120(–150) cm high. Corm (15–)20–30 mm in diameter. Foliage leaves either contemporary with flowering stem (subsp. *dalenii*) and 4–6(–7), or borne later on separate shoots (subsp. *andongensis*) and 2–4 on the flowering stem, then foliage leaves produced on separate shoots after flowering, blades narrowly lanceolate to more or less linear, (5–)10–20(–30) mm wide, about half as long as spike. Spike (2–)3–7(–14)-flowered. Flowers either red to orange with a yellow mark on each of 3 lower tepals, or yellow to greenish and often with red to brown streaks on upper tepals; perianth tube (25–)35–45 mm long, nearly cylindrical and curving outward in upper half; tepals unequal, 3 upper broadly elliptic-obovate, dorsal largest, 35–50 × 22–30 mm, upper laterals about as long, 30–45 × 20–30 mm wide, lower 3 tepals curving

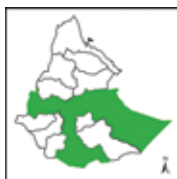
Fig. 111.
Gladiolus dalenii
subsp. *dalenii*,
from Tanzania.



downward, 20–25(–30) × 8–12 mm. Filaments c. 25 mm long, exserted 15–18 mm from tube. Style arched over stamens, dividing near apex of anthers, branches (4–)5–6 mm long. Capsules ellipsoid to ovoid, (18–)25–35 mm long 12–14 mm in diameter at wide.

Subspecies

1. Leaves of flowering stem with long well-developed blades (i.e., leaves and flowers seen together). a. subsp. *dalenii*
- Leaves of flowering stem either entirely sheathing or with short blades to 10(–15) cm long and long-bladed foliage leaves always produced on separate shoots later in the season (i.e., leaves and flowers not seen together). b. subsp. *andongensis*



Gladiolus dalenii
subsp. *dalenii*

Habitat and distribution

a. subsp. *dalenii*

Plant (50–)70–120 cm high. Leaves borne on flowering stem, 4–6(–7), at least lower 2 basal or nearly so, narrowly lanceolate to more or less linear, (5–)10–20(–30) mm wide, about half as long as spike, upper 1–2 leaves cauline and sheathing for at least half their length, sometimes entirely, often imbricate. Flowers with tube 35–45 mm long, dorsal tepal (35–)40–50 mm long. Filaments 25–30 mm long, exserted 15–20 mm from tube.

It grows in grassland, light woodland and bush between 870 and 1600 m and is fairly widespread in Ethiopia. It is also common throughout tropical and in southern Africa. The main flowering period in Ethiopia is from May to September; sometimes also from January to February.



Gladiolus dalenii
subsp. *andongensis*

b. subsp. *andongensis* (Baker) Goldblatt

The subspecific epithet '*andongensis*' refers to the region of origin where the collection was made, *Pungo Andongo* in northwestern Angola. The subspecies was described by Baker in 1892 from a plant collected by Welwitsch.

Plant 60–90 cm high. Leaves not contemporaneous with flowers, those of flowering stem 2–4, short and entirely sheathing, 6–14 cm long, or sometimes with blades 20–30(–50) × 6–12 mm, imbricate and sheathing lower half of stem; foliage leaves emerging from separate shoots later, usually at least 2, narrowly lanceolate, 300–500 × 4–16 mm. Flowers with tube 25–33(–40) mm long; dorsal tepal 35–45 × 22–25 mm. Filaments *c.* 25 mm long, exserted 15–18 mm from tube.

Habitat and distribution

It grows mainly in highlands, in grassland or light woodland between 1300 and 2100 m in Sidamo, Gamo Gofa, Kefa and Wellega floristic regions. It is also widespread in tropical Africa. The main flowering period in Ethiopia is from April to June; sometimes also from January to February.



Gladiolus roseolus

7. *Gladiolus roseolus* Chiov.

The specific epithet '*roseolus*' refers to the pink to pale colour of the perianth which is observed in some population of the species. The species was described by Chiovenda in 1911 from plants collected from northern Ethiopia, one of which is from the Semien, on rocky meadow on the slopes of Limalmo in Gonder floristic region.

The species is unique among the indigenous species (except in *G. dalenii* subsp. *andongensis*) in having foliage leaves produced from separate shoots after flowering time. It is easily distinguished from it in that *G. dalenii* subsp. *andongensis* has larger flowers, 60–95 mm long, longer stamens with the anthers well exserted from the perianth tube and red to pale-pink flowers.

Description

Plant (40–)60–90 cm high. Corm 25–30 mm in diameter. Foliage leaves (of flowering stem)(1–) 2–4, short and almost entirely sheathing, sometimes with short blades, 6–14 cm long. Stem unbranched, 2–3 mm in diameter below first flower. Spike (2–)5–10-flowered. Flowers whitish with a pink flush to pink, sometimes speckled with minute red dots; perianth tube 18–22 mm long, cylindrical, curving outward and widening above; tepals unequal, upper three largest, ovate-elliptic, 26–30 mm long, 10–



Fig. 112.
Gladiolus
roseolus, from
Wellega floristic
region.

12 mm wide in midline, dorsal arched almost horizontally over stamens, lower 3 tepals lanceolate, curving downward, $20-24 \times 4-6$ mm, lower laterals smallest. Filaments *c.* 12 mm long, exserted 4–5 mm from tube; anthers 10–12 mm long, pale yellow. Style arching over stamens, dividing 2–4 mm beyond apex of anthers, branches 4–5 mm long. Capsules narrowly obovoid, 20–25 mm long.

**Habitat and
distribution**

The species grows in *Combretum-Terminalia* woodland and bamboo thicket, in open woodlands often on rocky sites between 1200 and 2200 m in Gonder, Gojam, Shewa, Kefa, and Wellega floristic regions. It also occurs in Togo, Nigeria and Cameroon. The main flowering period in Ethiopia is from May to June.

Fig. 113.
Gladiolus
pauciflorus,
from near the
Sidambale
bridge, Bale
floristic region.



Gladiolus pauciflorus

8. *Gladiolus pauciflorus* Baker

The specific epithet '*pauciflorus*' refers to the few (*pauci*-) flowers (*-florus*), 2–4 (sometimes more) on the inflorescence. The species was described by Baker in 1886 from a plant collected on Kilimanjaro, Tanzania.

The species is distinguished from other indigenous species by its consistent 4–5 foliage leaves and cream to yellowish-green flowers with distinct red streaks.

Description

Plant 80–105 cm high. Corms 15–22 cm in diameter. Foliage leaves (3–)4–5, lower (2–)3–4 basal and largest, narrowly lanceolate, (6–)8–15 mm wide, reaching to about base of spike. Stem unbranched, 3–3.5 mm in diameter at base of spike. Spike (2–)4–8(–10)-flowered. Flowers cream to yellowish-green, or sometimes pink to reddish, or flushed orange, lower 3 tepals often with a dark purple median streak; perianth tube (20–)35–45 mm long, cylindrical below, widening toward apex; tepals broadly or narrowly lanceolate, upper 3 largest 30–45 × 18–24 mm, lowermost nearly as long as upper, lower laterals substantially smaller. Filaments 22–24 mm long, exserted 10–14 mm from tube. Style arched over stamens, dividing just below anther apices, branches 4–7 mm long, ultimately exceeding anthers. Capsules obovoid, 15–20 mm long.

Habitat and distribution

The species occurs in the highlands in open grassland or woodland between 1500 and 1600 m in Bale, Harerge and Sidamo floristic regions. It also occurs in Kenya, northern Tanzania, and Uganda. The main flowering period in Ethiopia is from April to June.

9. *Gladiolus gunnisii* (Rendle) Marais

The specific epithet '*gunnisii*' is named after a member of an expedition, F. G. Gunnis that collected specimens on the mountains south of Berbera, in northern Somalia.

*Gladiolus gunnisii*

The species was described by Rendle in 1898 as *Acidanthera gunnisii* from a plant collected at Toghdeer, top of Mt Wagga, in northern Somaila by Lort-Phillips. The name was later transferred to the genus *Gladiolus* by Marais in 1973.

G. murielae, *G. candidus* and *G. gunnisii* are the only three species in Ethiopia with perianth tube twice as long as tepals. The latter is easily recognised by the white to cream flower, included filaments and narrow grass-like leaves.

Description

Plant 25–35(–45) cm high. Corm globose-conic, 11–14 mm in diameter. Foliage leaves 3–5, lower 2–3 basal, a third as long as stem, blades linear, 2–3(–4.5) mm wide, upper leaves cauline and progressively shorter, sometimes uppermost entirely sheathing. Stem unbranched. Spike (1–)2–3-flowered. Flowers white to pale yellow, strongly fragrant; perianth tube slender, 80–120 mm long, expanding in upper 10 mm; tepals evidently subequal, nearly elliptic, dorsal probably horizontal, remaining tepals spreading, 25–30 mm long. Filaments *c.* 9 mm long, included in tube or barely exerted for *c.* 1 mm. Style dividing *c.* 5 mm beyond anther apices, branches *c.* 5 mm long. Capsules and seeds unknown.

Habitat and distribution

It grows in mountaineous areas, in rocky habitats between 1500 and 2300 m in Bale and Sidamo floristic regions in Ethiopia and in Eritrea. It also occurs in Somalia and northern Kenya. The main flowering period in Ethiopia is from May to June.

*Gladiolus longispathaceus*

10. *Gladiolus longispathaceus* Cufodontis

The specific epithet '*longispathaceus*' refers to the inflorescence having long (*longi-*) spathes (*-spathaceus*). The species was described by Cufodontis in 1969 from a plant collected on Mt Dita in the Gamo Gofa floristic region by Kuls.

The species is related to *G. abyssinicus*, but distinguished by the flowers with the upper laterals about as long as the dorsal tepal and by the larger bracts. In contrast, *G. abyssinicus* has dorsal tepal twice as long as the upper laterals and smaller bracts.

Description

Plant (45–)60–90 cm high. Corm 15–30 mm in diameter. Foliage leaves 5–6, lower 4–5 more or less basal and larger, upper 1–2 cauline and reduced, narrowly lanceolate to nearly linear, 7–15 mm at widest. Stem unbranched, 3–4 mm in diameter at base of spike. Spike 8–12-flowered. Flowers bright red, lower 3 tepals

yellow; perianth tube in lower part slender and erect, 20–25 mm long, expanding and curved outward into a cylindrical, more or less horizontal upper part *c.* 15 mm long; tepals unequal, dorsal largest, 32–35 × 20–22 mm, upper and lower laterals slightly shorter and lower tepals reduced. Filaments 27–35 mm long, exserted 12–15 mm from tube.. Style arched over stamens, dividing just beyond apices of anthers, branches *c.* 4 mm long, strongly expanded above when unfolded. Capsules broadly ovoid, 10–14 mm long.

Habitat and distribution

It grows in the highlands, in moist habitats, streams and wet rocks between 2400 and 4000 m in Bale and Gamo Gofa floristic regions. It is not known anywhere else. The main flowering period is from July to October.



Gladiolus abyssinicus

11. *Gladiolus abyssinicus* (Brongn. ex Lemaire) Goldblatt & de Vos

The specific epithet ‘*abyssinicus*’ refers to the former name of Ethiopia, Abyssinia where the original collection was made. The species was validly published in 1845 as *Antholyza abyssinica* by Lemaire (based on the work of Brongnart) from a plant collected on Mt Solloda, near Adwa in Tigray by Quartin-Dillon. The name was transferred to the genus *Gladiolus* by Goldblatt and de Vos in 1989.

The species is recognised from related species in Ethiopia by the dorsal tepal which is about twice as long as the upper lateral tepals and the lower three tepals reduced to short cusps.

Description

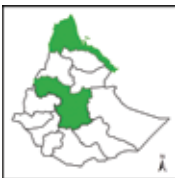
Plant 45–65 cm high. Corm 15–25 mm in diameter. Foliage leaves 5–6, lower 4–5 more or less basal and largest, upper 1–2 cauline and reduced, narrowly lanceolate to nearly linear, reaching at least to base of spike, sometimes slightly exceeding it, 7–15 mm at widest part. Stem sometimes with 1 branch, usually 3–4 mm in diameter at base of spike. Spike 8–12 flowered. Flowers red on upper three tepals, greenish tipped yellow on lower, throat and perianth tube yellowish; tube 27–32 mm long, lower part slender and erect *c.* 15 m long, expanding and gradually curved outward into a cylindrical, more or less horizontal upper part, 12–16 mm long; tepals very unequal, dorsal, extended nearly horizontally, (20–)24–35(–40) mm long, up to 14 mm wide, upper laterals directed forward, lanceolate, 12–20 × 12 mm lower tepals reduced, laterals lanceolate, 8–15 mm long, lowermost nearly 6–12 mm long. Filaments 25–30 mm long, exserted for up to 1–5 mm. Style dividing near to or slightly beyond apices of anthers, branches *c.* 4 mm long, much expanded in upper half. Capsules obovoid-ellipsoid, 10–12 mm long.

Fig. 114.
Gladiolus
abyssinicus, from
Gonder floristic
region.



**Habitat and
distribution**

It grows in the highlands, in well-watered grassland, cliffs and rock outcrops, and stream sides mostly between 2000 and 3350 m in Tigray, Gonder, Gojam, Welo, Shewa, Bale, and Harerge floristic regions in Ethiopia and in Eritrea. It also occurs in Saudi Arabia. The main flowering period in Ethiopia is from August to October.



Gladiolus
schweinfurthii

12. *Gladiolus schweinfurthii* (Baker) Goldblatt & de Vos

The specific epithet '*schweinfurthii*' was given in honour of the collector, Georg Schweinfurth from whose collection the type of the species was designated. The species was described by Baker in 1894 as *Antholyza schweinfurthii* from a plant collected in Eritrea without a precise locality. The name was later transferred to the genus *Gladiolus* by Goldblatt and de Vos in 1989.

The species is closely related to and possibly not separate from *G. abyssinicus*, but distinguished by its shorter perianth tube (11–16 mm long). In contrast *G. abyssinicus* has perianth tube 27–32 mm long.

Description

Plant (30–)50–75 cm high. Corm 8–15 mm in diameter. Foliage

leaves (3–)4–5, at least lower 2 basal and largest, upper 1–2 cauline and reduced, lanceolate to nearly linear, plane, half to two-third as long as stem, not reaching base of spike, 4–12(–20) mm at widest. Stem simple or with 1–2 branches. Spike 2–7(–12)-flowered. Flowers bright red to orange-red on upper tepals, greenish fading to yellow on lower tepals, throat and perianth tube; tube 11–16 mm long; tepals very unequal, dorsal largest, extended horizontally 12–18(–22) mm long, upper laterals directed forward, lanceolate, 8–12(–14) mm long, lower tepals reduced, laterals narrowly lanceolate, 6–8 mm long, lowermost a linear cusp 3–6 mm long. Filaments 16–20 mm long, exserted 5–8 mm from tube. Style ultimately reaching near to apices of anthers, branches 3–4 mm long, extended beyond anthers and much expanded above. Capsules globose-ovate, (7–)9–12 mm long.

Habitat and distribution

The species grows in bushland and grassland between 750 and 2900 m in Gojam, Shewa, Arsi floristic regions in Ethiopia and in Eritrea. It also occurs in Somalia and Kenya. The main flowering period in Ethiopia is from August to October; sometimes also from January to February.



Gladiolus sudanicus

13. *Gladiolus sudanicus* Goldblatt

The specific epithet '*sudanicus*' refers to the country, *Sudan* from where the collection of the type specimen was made.

The species was described by Goldblatt in 1996 from a plant collected at the Nuba Mountain in the Sudan.

The species can be confused with *G. dalenii* subsp. *andongensis* which also has red flowers. But it is clearly distinguished from this subspecies by the shorter perianth tube (16–20 mm long) in contrast to (25–)35–45 mm long in *G. dalenii*. Further, the tepals are uniformly colored in *G. dalenii*, but with distinct yellow marks in *G. sudanicus*.

Description

Plant 15–20 cm high. Corms 10–12 mm in diameter. Foliage leaves 4–5, lower narrowly lanceolate to linear and about as long as stem, 5–9 mm wide, uppermost smallest and partly to entirely sheathing. Stem simple, c. 1.5 mm in diameter at base of spike. Spike erect, 2–3-flowered. Flowers red or pale to deep pink, lower 3 tepals each with a yellow-green median streak outlined in red; perianth tube 16–20 mm long, arching outward and expanded above; tepals unequal, narrowly lanceolate, 3 upper 20–24 × 4–5 mm, 3 lower 16–18 mm long and these joined to upper laterals for c. 3 mm. Filaments 10–12 mm long, exserted 2–3 mm from tube; anthers c. 6.5 mm long, violet, with a short acute apiculus, 0.5–1 mm long.

Fig. 115.
Gladiolus
sudanicus, from
Blue Nile gorge,
Shewa floristic
region.



Style dividing opposite middle of anthers, branches *c.* 2 mm long, not exceeding anthers. Capsules and seeds unknown.

**Habitat and
distribution**

The species grows in relatively arid land among shrubs in seasonally wet sites between 1000 and 1200 m in the Blue Nile Gorge in Shewa floristic region. It is further known from the Nuba Mountain in Kordofan, Sudan. The main flowering period in Ethiopia is from August to September.



Gladiolus lithicola

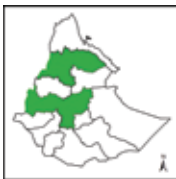
14. *Gladiolus lithicola* Goldblatt

The specific epithet '*lithicola*' refers to the habitat of the plant, which literally means stone (*lith-*) dwelling (*-icola*). The species was described by Goldblatt in 1996 from a plant collected on the slopes of Mojjo River and south of Gara Muleta in the Hararge floristic region by Burger.

The species is the most distinctive of the indigenous species by its short inflorescences much shorter than the long drooping leaves, by the relatively small pale mauve perianth, and by the short dark-violet stamens borne at the mouth of the perianth tube.

Description Plant (8–)12–28 cm high. Corm 8–10 mm in diameter, with tunics of fine-netted fibres. Leaves 2–4, lowermost longest, 1.5–2.5 times as long as stem, blades linear, (2–)3–4 mm wide, uppermost smallest and with oblong blades or largely to entirely sheathing. Stem erect below, flexed outward above sheath of uppermost leaf, unbranched. Spike (1–)2–3-flowered; bracts green, 15–30(–35) mm long, usually attenuate, inner about two-third as long as outer. Flowers bluish-purple (mauve), tepals evidently unmarked; perianth tube narrowly funnel-shaped, *c.* 18 mm long; tepals lanceolate, unequal, dorsal and upper laterals *c.* 18 mm long, 3 lower *c.* 20 mm long. Filaments short, *c.* 6 mm long, included in tube; anthers *c.* 5 mm long, dark-violet, apices drawn into short acute appendages. Ovary oblong, *c.* 4 mm long; style arching over anthers, dividing at or 1–2 mm beyond anther apices, branches *c.* 2.5 mm long. Capsules and seeds unknown.

Habitat and distribution The species grows on steep rocky slopes and cliffs, between 2100 and 2750 m, in areas originally forested, but today largely cleared. It is only known from Gara Muleta in Harerge floristic region. The main flowering period is from August to October.



Gladiolus murielae

15. *Gladiolus murielae* Kelway

The specific epithet '*murielae*' is named in honour of Muriel Erskine, the wife of the collector.

The species was described by Kelway in 1932 from a plant collected from Ethiopia without precise locality by Erskine. The species is also known (and cultivated) under the name *Acidanthera bicolor*.

Gladiolus murielae, *G. candidus*, and *G. gunnisii* are the only three species in Ethiopia with a perianth tube twice as long as the tepals. *G. murielae* is distinguished from the others by the white flowers with prominent dark purple streaks and tepals 35–45 mm long.

Description Plant 30–65 cm high. Corm 15–22 mm in diameter. Foliage leaves 4–8, lower 3–5 basal, narrowly lanceolate, reaching at least to base of spike, sometimes slightly exceeding it, 5–12 mm at widest. Stem unbranched, 3–4 mm in diameter at base of spike. Spike often inclined, 3–5-flowered. Flowers white, with a prominent dark purple median streak, sweetly scented, particularly strongly in evenings;

perianth tube cylindrical and straight, slightly wider near throat, (90–)120–150 mm long; tepals more or less equal, lanceolate, 35–45 × 17–22 mm. Filaments exserted for 10–15 mm long. Style arching over stamens, dividing beyond anthers, branches c. 5 mm long, much expanded in upper half. Capsules oblong-ellipsoid, 20–25 mm long.

Habitat and distribution

The species grows in the highlands in rocky, partly shaded places, on cliffs, rocky outcrops, and in forest margins between 1800 and 2400 m in Tigray, Gonder, Shewa, and Wellega floristic regions. It also occurs in Burundi, Tanzania, Malawi and Mozambique. The main flowering period in Ethiopia is from July to September.



Gladiolus candidus

16. *Gladiolus candidus* (Rendle) Goldblatt

The specific epithet '*candidus*' refers to the pure glossy white flowers. The species was described by Rendle 1895 as *Acidanthera candida* from a plant collected in Athi Plains, Lanjaro in Kenya by Gregory. The name was later transferred to the genus *Gladiolus* by Goldblatt in 1995.

G. murielae, *G. candidus*, and *G. gunnisii* are the only three species in Ethiopia with a perianth tube twice as long as the tepals. *G. candidus* is distinguished from the closely related *G. murielae* by the perianth tube commonly being 80–100 mm long, and the uniformly white tepals. *G. murielae* has a perianth tube that is 120–150 mm long, and the tepals have dark purple marks.

Description

Plant 20–40 cm high. Corm globose, 12–25 mm in diameter. Foliage leaves 2–3, all more or less basal, narrowly lanceolate, about half as long as stem, 5–10 mm wide. Stem erect, unbranched, c. 2.5 mm in diameter below first flower. Spike erect, 2–4-flowered. Flowers white (rarely pink), occasionally with purple median lines, sweetly scented; perianth tube (70–)80–100 mm long, more or less straight and cylindrical; tepals subequal, broadly lanceolate to elliptic, (20–)25–30 × c. 15 mm. Filaments exserted for 10–15 mm long. Style dividing opposite anther apices, branches 5–7 mm long, often broad and fringed above. Capsules narrowly elliptic to obovate, 18–22 mm long.

Habitat and distribution

The species grows in woodland and dry grassland between 1450 and 2250 m in Arsi, Sidamo, Bale, and Harerge floristic regions. It also occurs in Djibouti, Somalia, Kenya, Tanzania and Oman.

HYPOXIDACEAE

Within the lilies in the wide sense, the Ethiopian representatives of Hypoxidaceae are unequivocally recognised by having more or less tuberous rhizomes and by being generally pubescent plants, with leaves in a three-ranked basal rosette. The tepals are placed above the ovary, meaning the flowers are epigynous as in Amaryllidaceae and Iridaceae. The flowers are yellow on the inside, greenish and hairy on the outside, in a more or less racemose inflorescence, sometimes reduced to only one flower.

The species in this family are herbaceous geophytes, storing nutrition in corm-like rhizomes, which can be interpreted as slow-growing underground trunks. The efficient store organs make the plants able to sprout and flower shortly after the first rains. The rhizomes grow in the apical part, but are kept underground by conspicuous contractile roots. The leaves are linear to lanceolate, pubescent with simple and/or compound hairs. Old leaves die back in the dry seasons and are replaced by new ones produced successively through the growing season, inside the old ones and fibrous leaf remnants. The plants appear to be particularly adapted to survive heavy grassland fires, due to the well-protected subterranean parts with the apical meristem deeply hidden among old fire resistant leaf remnants. Inflorescences (sometimes only one-flowered) are produced continuously through the growing season from the axils of the successively produced leaves. The flowers, developing from the axils of small bracts (in *Hypoxis*) or large and leafy bracts (in *Curculigo*), are bisexual and star-shaped. The tepals, 3+3, are persistent, subequal and free. The stamens arise from the base of tepals and have rather short filaments fixed to the base of anthers (basifixed). The anthers release the pollen through lateral longitudinal slits (latrorse opening). The fruits are either capsules, opening by a lid or by three slits (in *Hypoxis*) or subterranean and berry-like, that is, with more or less succulent to membranaceous fruit wall, indehiscent and slowly disintegrating (in *Curculigo*).

Mature seeds are black to brownish, with a thick black (phytomelan) crust and copious fatty endosperm.

Distribution and classification The family is widely distributed in grasslands and woodlands in tropical and subtropical regions of all continents, particularly in the Southern Hemisphere, where it has a centre of diversity in South Africa. It includes 9 genera of which 2, *Hypoxis* and *Curculigo*, are represented in the Horn of Africa. Modern analyses indicated that the family is related to the orchids.

Reproduction The flowers do not display any sophisticated pollination adaptations, and lack nectaries. They tend to attract unspecialised insects that will get their reward in pollen. The flowers are slightly protandrous, meaning that the anthers mature before the stigma, a mechanism to avoid self-pollination.

Most species in the genus *Hypoxis* have been shown to reproduce by apomixis, meaning that the embryos develop from unreduced egg cells. This mechanism leads to parthenogenesis, which genetically corresponds to cloning of the mother plant. Apomixis is rare in the tropics, becoming more common towards the Arctic (where pollinators are scanty), and will always create problems in defining the boundaries among the species. Without gene flow in the populations, more or less definable clones may behave as taxonomic entities, and the species concept becomes diffuse.

Key to the genera

1. Leaves without a petiole and not plicate; inflorescence most often with several flowers; ovary above the ground and situated directly below the tepals; fruit a capsule opening by slits or by a lid; seeds without a hook 1. *Hypoxis*
 - Leaves petiolate and plicate; inflorescence 1-flowered; ovary subterranean and separated from the tepals by a tube/beak; fruit berry-like, releasing the seeds by being eaten or by disintegrating in the soil; seeds with a conspicuous hook 2. *Curculigo*
-

1. HYPOXIS L.

The rhizomes/corms, sometimes branched, have an inner core of vascular bundles intermingled with fibrous tissue, and an outer spongy storage area, crossed by numerous mucilage canals with yellowish or whitish sap, often darkening on exposure. The roots are stout and contractile, arranged in an equatorial zone on the rhizomes/corms, drying up at the end of each season, leaving distinct scars, a row of new roots being produced in a ring above the scars in the next season. The leaves are linear to lanceolate, acute; midrib and leaf margin always pubescent, sometimes also the lamina, often with different kind of whitish or yellowish hairs. The scapes are pubescent. The flowers are situated in racemose, corymbose, or spicate inflorescences, rarely solitary. They are subtended by small bracts. The pedicels are long or short. The ovaries have a short style and three distinct stigmatic zones lining the upper part of the style. The capsules open by a lid (pyxidal dehiscence) or by splits (loculicidal dehiscence). The seeds are subglobose, black, shiny and more or less papillate or brownish dull (due to folding of the waxy cuticula).

Hypoxis is a large pan- to sub-tropical genus. The few species that are diploid and sexual are easy to separate. Most species are, however, apomictic with high chromosome numbers, indicating hybridisation accompanied by chromosome doubling, and are difficult to separate. It is therefore problematic to assess the number of species. In the Flora of Ethiopia and Eritrea two 'good' species (diploid and sexual) were recognised: *H. angustifolia* Lam. and *H. schimperi* Baker. All the forms belonging in the polyploid apomictic complex were previously lumped into the *Hypoxis villosa* complex in the Flora. Since the publication of the Flora the genus *Hypoxis* has, however, been analysed in Southern Africa, and the name *H. villosa* L. will have to be restricted to a Cape species. In our treatment here we will therefore treat formerly described apomictic taxa at the species level ('microspecies'), but one must be aware that forms might be found that may not easily fit the species as they are delineated here.

Reproduction The pollination syndrome appears to be the same for both *Hypoxis* and *Curculigo* (see above). The *Hypoxis* species

that have capsules opening by a lid, have erect fruits and stiff erect scapes; traits characteristic of ballistic dispersal in that the seeds are held back on the mother plant until a strong push (by wind or animals) throws them out. The *Hypoxis* species with capsules opening by slits, have lax peduncles releasing the seeds on the soil surface close to the mother plant. Here the seeds require animals or water flushes for further dispersal. It is interesting to note that species with strong cuticular folding on the seed tend to release the seeds on the ground. It should be examined whether this particular seed coat structure might be of interest to small herbivores.

Chemistry and use Mucilage canals containing pectin compounds of mucopolysaccharides penetrate the tubers of *Hypoxis*. Steroid saponins (that is molecules resembling human hormones in structure) are also present. Species of the genus *Hypoxis* have recently been extremely popular in southern Africa ('African potatoes'), as they are suspected to have an immunological effect, which might be of interest in connection with the HIV/AIDS epidemic. Reports tell that plants are collected in such large quantities to be sold at local markets, that they may go extinct in parts of South Africa and Zimbabwe. More studies are certainly needed.

Key to the species

The species numbered 3 to 7 below, belong to an apomictic polyploid complex and might be difficult to identify. *Hypoxis abyssinica* is widespread on the Horn of Africa, the others are rather local and not sufficiently known.

1. Slender plants; leaves linear, narrower than 0.5 cm; seeds dull, brownish, papillose, with cuticular folding on the papillae 2
 - Slender to robust plants; leaves linear to lanceolate, broader than 0.5 cm; seeds glossy, black, papillose or not, without cuticular folding on the papillae 3
2. Inflorescence with (1–) 3–5 flowers; lower pedicel longer than 1 cm; tepals 5–8 mm long; capsule turbinate, distinctly longer than broad when ripe, opening with longitudinal slits 1. *H. angustifolia*
 - Inflorescence with 1 (–2) flowers; all pedicels shorter than 0.5 cm; tepals 7–10 mm; capsules conical, length about equalling the diameter in the apical part when ripe, opening with a lid 2. *H. schimperi*
3. Slender plants, leaf width up to 0.3–2 cm, tepal length up to 10 mm long 4

- Robust plants, leaf width 1.5–2.5 cm, tepal length 10–15 mm 6
- 4. Leaf width 0.5–2 cm, inflorescence with 2–5 flowers 5
- Leaf width 0.3–0.5 cm, 1–2 flowers, rarely more, only known from the Negelle area 5. *H. neghellensis*
- 5. Leaves more or less prostrate, up to 1 cm wide 3. *H. abyssinica*
- Leaves more or less erect, 1–2 cm wide 4. *H. boranensis*
- 6. Inflorescence with 2–6 flowers 6. *H. tristycha*
- Inflorescence with more than 8 flowers 7. *H. fischeri*

*Hypoxis angustifolia*

1. *Hypoxis angustifolia* Lamarck

The species epithet '*angustifolia*' refers to the narrow leaves (*angustus* = narrow, *folium* = leaf). It was described by the famous French naturalist, Jean Baptist Lamarck, based on material from Mauritius, as early as in 1789. It can be recognised by the long, slender grasslike leaves, the relatively small flowers on rather long pedicels, the fruits opening by longitudinal slits, and by the cuticular folding on the seed coat. The last trait is shared by *H. schimperii*, but the two species can easily be distinguished on the differing pedicel length (longer than 1 cm in *H. angustifolia*), tepal length (shorter than 8 mm), and capsule dehiscence (longitudinal slits).

Description

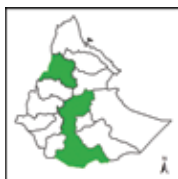
Grasslike plants from a corm 1–2.5 × 0.8–2 cm, whitish or yellowish inside. Leaves erect or lax, linear (10–) 25–35 × 0.2–0.7 cm, except for very early in the growing season always by far overtopping the flowers, covered by long whitish to yellowish hairs. Peduncle 3–12 cm long. Inflorescence corymbose with (1–) 3–5 flowers; pedicels longer than 1 cm. Tepals 5–8 mm, anthers with an apical split. Capsule turbinate, distinctly longer than broad when ripe, thin-walled so that the seed contours are visible, loculicidal opening. Seeds with a special cuticular folding on the seed coat papilla, making them dull brownish.

Habitat and distribution

The species belongs in open woodland and bushland, but is most frequently found in treeless and seasonally swamped grassland, often heavily grazed, on blackish to reddish more or less heavy clayish soils between 1275 and 2800 m. It is recorded from Gonder, Shewa, Bale, Sidamo, Kefa, and Wellega floristic regions. It is also widespread in Tropical Africa reaching Mauritius in the

Indian Ocean. The main flowering period in Ethiopia is from April to June, in the south flowers may, however, reappear in November.

In the Flora of Tropical East Africa (Wiland-Szymanska & Nordal 2006) it was stated that the mainland African specimens of the species should be referred to a separate variety, var. *luzuloides* (Robyns & Tournay) Wiland, as it has turned out that the type specimen from Mauritius is lacking the typical cuticular folding of the seed coat.



Hypoxis schimperi

2. *Hypoxis schimperi* Baker

The species is named after the German collector of Ethiopian plants in the 19th century, G.W. Schimper. It was described by Baker in 1878, based on material from the Gonder floristic region ('Begemder'). The species is closely related to *H. angustifolia*, but has most often only one flower with somewhat larger flowers, tepals 7–10 mm, shorter pedicels (up to 5 mm) and a capsule opening with a lid rather than with slits.

Description

Corm subglobose, 1.5–2 cm wide, often carrying a dense tuft of fibres. Leaves linear, 20–25 × 0.2–0.3 cm, almost glabrous, 1–2 flowered, pedicels short, up to 0.5 cm; tepals 7–10 mm, capsule dehiscence by a lid. Seeds dull brown due to the special cuticular folding.

Habitat and distribution

The species grows in grassland valley bottoms with a high water table, between tussocks, but is also found in *Podocarpus* forest, often on black soils between 950 and 2700 m: It is recorded from the Gonder, Shewa and Sidamo floristic regions. It is otherwise found in Eastern Africa south to Zimbabwe. The main flowering period in Ethiopia is in May.



Hypoxis abyssinica

3. *Hypoxis abyssinica* Hochst. ex A.Rich.

The species epithet refers to the older name for Ethiopia (Abyssinia). The species was discovered by Hochstetter and described by Richard in 1851, based on material from Mount Scholoda in Tigray. The most narrow-leaved specimens within this form has often been confused with *H. angustifolia*, from which it differs in fruit and seed



Fig. 116. *Hypoxis abyssinica*. Above: Population sample from Shewa floristic region. All individuals fall within the three size classes shown, with no intermediates, indicating apomictic reproduction and no gene flow between classes. Right: plant from Wellega floristic region.



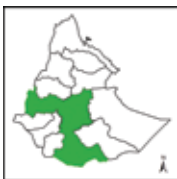
characters, but also by its slightly larger flowers and wider leaves.

Description

Fairly small plants with corms subglobose to cylindrical 1–6 × 1–4 cm. Leaves, with strong ribs, almost recurving to almost prostrate, 5–20 × 0.5–1.0 cm; indumentum whitish or yellowish, dense on margin and midrib, but also scattered on the lamina. Peduncles 2.5–10 cm. Inflorescence racemose with pedicels of uneven length. Flowers (1–) 2–4, tepals 8–10 mm long. Fruit 5–7 mm long, seeds black and glossy, almost without papillae, c. 1 mm in diameter.

Habitat and distribution

The species belongs in disturbed woodland and grassland, evergreen bushland, *Eucalyptus* plantations and mountain forest to the ericaceous belt up to 3100 m. It is endemic and widespread in Ethiopia and Eritrea. The main flowering period is from March to June and from August to November.



Hypoxis boranensis

4. *Hypoxis boranensis* Cufod.

The species epithet refers to the Borana area in southern Ethiopia, from where this species was described by Cufodontis in 1939. It resembles *H. abyssinica*, but is

more robust with longer, broader and more erect leaves (these differences might be related to the fact that *H. boranensis* is found in areas less disturbed and grazed compared to areas where *H. abyssinica* grows).

Description Leaves 25–50 (–75) × 1–2 cm, and more erect leaves. Inflorescence 2–5 flowered, with pedicels 1–2 cm long. Tepals 9–10 mm long.

Habitat and distribution It is found in woodland and is probably endemic, recorded from the Shewa, Arsi, Sidamo, and Wellega floristic regions, possibly also in Eritrea.



Hypoxis neghellensis

5. *Hypoxis neghellensis* Cufod.

The species epithet refers to the township of Negelle in Sidamo, from where this species was described by Cufodontis in 1939. It resembles *H. boranensis*, but has somewhat narrower leaves (up to 0.5 cm wide).

Description Leaves 15–35 × 0.3–0.5 cm. Inflorescence 1–2 (–5) flowered.

Habitat and distribution This species is found in dry grassland and in open *Combretum* woodland around Negelle in Sidamo between 1500 to 1800 m.



Hypoxis tristycha

6. *Hypoxis tristycha* Cufod.

The species epithet is Greek and refers to the leaves that are organised in three ranks. The species was described by Cufodontis in 1939 based on material from Mega in the Sidamo floristic region. *H. tristycha* resembles *H. abyssinica*, but is more densely pubescent and more robust in every quantitative trait.

Description Corms c. 7 × 4 cm. Leaves falcate, in three ranks, c. 20 × 2–2.5 cm. Inflorescence 2–6 flowered with tepals 10–15 mm long.

Habitat and distribution The species is only found in the Sidamo floristic region between 1800 and 2100 m.



Fig. 117. *Hypoxis fischeri*, from Wellega floristic region.



Hypoxis fischeri

7. *Hypoxis fischeri* Pax

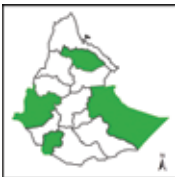
The species was described on material from the Lake region of East Africa by Pax in 1893, in honour of the collector, Fischer. This taxon might include more than one apomictic form from Wellega floristic region. One form is many-flowered (up to 8 in a racemose inflorescence), has leaves together with the flowers and is covered by a dense yellowish indumentum; lower pedicels up to 2 cm and tepals *c.* 10 mm long. It comes close to the type of *H. multiflora*, described from Uganda which was sunk into *H. fischeri* in the Flora of tropical East Africa (Wiland-Szymanska & Nordal 2006). Another form has flowers appearing before the leaves and almost silvery indumentum, spicate inflorescence with 10–15 flowers, and tepals up to 15 mm long. This form matches the type of *H. fischeri* Pax. More field studies are required to sort out the taxonomic problems.

CURCULIGO Gaertn.

The rhizomes are elongated and vertical, narrower than what is common in *Hypoxis*, often branched, with fleshy and contractile roots scattered more or less evenly on the rhizome. The leaves appear slightly after the first flowers, and they are three-ranked and petiolate with sheathing leaf bases; lamina linear to lanceolate, acute, plicate, prominently veined and sparsely pilose with mainly bifurcate to star-shaped whitish hairs. The scapes are short, subterranean and most often completely hidden by leaf remnants. The flowers are subsessile, single, and supported by large leafy involucral bracts surrounding the cylindrical ovary. Between the ovary and the tepals a narrow cylindrical pilose structure, separating these organs, develops, thus pushing the tepals out of the leafy protections. This structure has been differently interpreted as a perianth tube or an ovary extension. The style is filiform to subulate with a capitate to slightly trifidous stigma. The fruits are indehiscent, more or less berry-like at maturity, crowned with the persistent 'ovary beak'. The seeds are ellipsoidal with a hard, smooth, black, glossy seed coat, with a funicle expanded to form a prominent hook (the name *Curculigo* might be connected to this trait), plugged by a whitish tissue ('strophiole').

The genus includes about 10 species in Tropical Africa, Asia and America.

Reproduction The pollination is undertaken by unspecialized insects. The seed dispersal of *Curculigo* is particular as they develop underground fruits and seeds. Digging animals must be responsible, but no observations are recorded. It is possible that the 'strophiole' may act as an elaiosome and attract ants or termites. The ovaries are protected during the development, and the 'ovary beak' has probably evolved to combine ovary protection with flower exposure.



Curculigo pilosa

Curculigo pilosa (Schum. & Thonn.) Engler

The species epithet refers to the indumentum that covers the whole plant (*pilosus*=hairy). It was originally described on material from West Africa by Schumacher and

Thonning in 1828, who referred it to the genus *Gethyllis*, which now is known to be restricted to South Africa. In 1908 Engler transferred the species to its correct genus, *Curculigo*. Superficially it resembles *Hypoxis* species, but it is easily separated by the plicate leaves, the single flowered inflorescences and the subterranean ovary.

Description Plants up to 25 cm long from a up to 8 cm long rhizome. Leaves 0.3–2.5 cm broad, very short at early anthesis, elongating to 25 cm through the growing season, lamina sparsely pilose. Peduncle 0.5–1.5 cm long, hidden among cataphylls and leaf bases, subterranean. Flowers up to 2.5 cm in diameter, tepals 9–15 × c. 3 mm. Filaments 2–4 mm long, anthers ca 3 mm. Ovary subterranean, up to 15 mm long, surrounded by bracts up to 2 cm long; ovary beak 2.5–5 cm. Fruits up to 3 cm long, seeds 2–3 mm long.

Habitat and distribution This species is found in woodland or riparian forest, seasonally swampy, and seem to be favoured by frequent burning. It grows on black alluvium or on limestone between 550–3000 m. It has been recorded from the Ti-gray, Gamo Gofa, Illubabor, Wellega and Harerge floristic regions. It is otherwise widespread in the tropical African savannah belt from West Africa to Zimbabwe. The main flowering period in Ethiopia is from February to April.

ERIOSPERMACEAE

This family is unique by having seeds covered by long hairs. This trait is not found in other African lilies. It includes only one genus, which is distributed in sub-Saharan Africa. The relationship of the family to other lilies is disputed, and it appears to be an isolated family.

ERIOSPERMUM Jacq.

The genus was described by Jacquin in 1796 and refers to the hairy seeds (*erio* = hair, *spermum* = seeds in Greek).

The plants have prominent more or less globose tubers, which produce 1–3 leaves, the leaf bases forming a fibrous neck. The flowering stems are erect and lack leaves. The inflorescences are racemose carrying yellowish rather small flowers on long pedicels, supported by minute bracts. The 3 + 3 tepals are free and patent. The ovary is sessile and superior, developing into a capsule that opens with longitudinal slits, and containing 6–12 brownish seeds that are densely covered with long white hairs. There is only one other species in Ethiopia with yellow open flowers similar to those of *Eriospermum*, and that is *Bulbine abyssinica*, which differs by its distinctly hairy filaments. These are glabrous in *Eriospermum*.

Distribution and classification The genus includes about 100 species and has its centre of diversity in South Africa. Only two species reach Ethiopia, where they are rare.

Reproduction Little is known of pollination, but the flowers are visited by a wide range of insects, flies, small butterflies and beetles. Nectar is produced in glands in the walls of the ovary and is released in the bottom of the flower, where it is easily accessed. The seeds are effectively wind dispersed due to their small size, and by being covered with long hairs. South African species have been used as food and for different medicinal purposes.

Key to the species

1. Lower pedicel longer than 5 cm; leaf produced after flowering,
leaf blade rigid with prominent nerves 1. *E. abyssinicum*
- Lower pedicel shorter than 3 cm; leaves produced at the same time
as the flowers, leaf blade flexible with inconspicuous nerves 2. *E. triphyllum*



*Eriospermum
abyssinicum*

1. *Eriospermum abyssinicum* Baker

As the species epithet indicates the species was first described from Abyssinia, surprisingly as it is very rare and so far only recorded from Gonder, where Schweinfurth collected it in the 1870s. The single stiffly erect leaf makes it easy to identify even in sterile condition.

Description

Tuber (sub)globose, 2–4.5 cm in diameter, crowned with copious fibers. Leaf solitary, erect, lanceolate with a distinctly channelled petiole and with prominent nerves, 11–20 × 1–3.5 cm. Peduncle 8–19 cm long, pedicels ascending. Tepals yellowish, 5–10 × 1–2.5 mm. Capsules with three rooms, 6–9 × 6–7 mm. Seeds 4 × 2.5 mm covered with 5–7 mm long hairs.

Habitat and distribution

The species grows on rocky outcrops and open dry grassland. It flowers with the first rains and leaves are developed later. So far it is only known from Gonder floristic region in Ethiopia, close to the Sudan border. It is otherwise widely distributed in Africa west to the Ivory Coast and south to South Africa. The main flowering period in Ethiopia is in May.



Fig. 118.
*Eriospermum
abyssinicum*,
from Tanzania.

Fig. 119.
Eriospermum
triphyllum, from
Tanzania.



Eriospermum
triphyllum

2. *Eriospermum triphyllum* Baker

The species epithet refers to the habit of having, most often, three leaves. It was described from Kenya by Baker in 1893. Cufodontis described a species *E. heterophyllum* from around Negelle in Sidamo (meaning with differently shaped leaves), which falls within the variation of the widespread *E. triphyllum*.

Description

Tuber (sub)globose, 1.5–4 cm in diameter, crowned with copious fibers. Leaves 2–3 (–4) spreading, lanceolate without prominent nerves, 5–10 × 1–2 cm. Peduncle 2–11 (–15) cm long, pedicels arcuate, 1–2.5 cm long. Tepals pale yellow, flushed red-pink outside with green midrib, 6–9 × 1.5–2.5 mm. Capsules with three rooms, 8–10 × 8 mm. Seeds 3–4 × 2 mm covered with 7–8 mm long hairs.

Habitat and distribution

The species is found in open *Combretum-Terminalia-Acacia* woodland between 1600 and 1700 m. It is only found in Sidamo floristic region, but it is otherwise widespread in East Africa. The main flowering period in Ethiopia is from April to October.

DRACAENACEAE

The family includes trees, sometimes very large, or shrubs with woody stems (*Dracaena*) or xerophytic herbs with rhizomes (*Sansevieria*). Leaves leathery to thickly succulent, generally crowded in terminal rosettes, sometimes in 2 opposite ranks, linear to ovate, sometimes cylindrical, often containing hard fibres. Inflorescence axillary, simple or branched, racemes or panicles, sometimes umbel-like. Pedicels articulate, flowers solitary to densely crowded, often accompanied by minute bracts and bracteoles. The six tepals are fused at the base into a short or long tube. Stamens opposite the tepals, inserted at the throat, filaments usually somewhat inflated and spindle shaped, anthers versatile. The ovary is superior, cylindrical to bottle shaped, three-locular with a single ovule in each locule, style filiform, stigma capitate to 3-lobed. Fruits usually a berry, globose to subglobose, 1-3seeded. Seeds globose or flattened.

Distribution and classification

Dracaenaceae is mainly a tropical family, except one species, *Dracaena draco*, which is endemic for the Canary islands. The family includes 2 genera and 130–200 species. Both genera (*Dracaena* and *Sansevieria*) are represented in the flora of Ethiopia and Eritrea, *Dracaena* with 5 species and *Sansevieria* with 6. Some authors treat these genera as one, but they are kept separately in the Flora of Ethiopia and Eritrea, which is followed here.

Reproduction

Due to the strong fragrance emanating from the flowers during the evening, and the copious production of nectar, pollination by nocturnal animals is likely.

Use

A number of species of *Dracaena* and *Sansevieria* are used as ornamentals. Some species have variegated leaves. Some species of *Dracaena* produce commercially important resins which are often called Dragon's blood.

Key to genera

- | | |
|---|-----------------------|
| 1. Plant a tree or shrub with a woody trunk | 1. <i>Dracaena</i> |
| - Plant a herb, without a woody trunk | 2. <i>Sansevieria</i> |
-

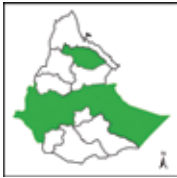
1. DRACAENA L.

The genus includes trees or shrubs with a more or less woody stem; usually with orange roots. Leaves sessile, linear to lanceolate. The inflorescence is a large panicle with 2 or more flowers in each floral bract. The flowers are white or pale green, fragrant and opening at night. The tepal-lobes are spreading or recurved. The stamens are slender or thickened. The fruit is a globose, coloured berry with 1–3 seeds.

The genus includes about 80 or more species, mainly in Africa. It is represented by 5 species in the Flora area.

Key to the species

- | | |
|--|----------------------------|
| 1. Leaves oblanceolate, sometimes variegated in cultivated plants; flowers in conspicuous spherical multi-flowered heads | 3. <i>D. fragrans</i> |
| - Leaves sword or dagger-shaped; flowers variously arranged, not in multi-flowered heads | 2 |
| 2. Leaves distinctly succulent, about 1 cm thick at the base, margins minutely scabrid | 4. <i>D. ombet</i> |
| - Leaves much thinner, leathery, margins smooth | 3 |
| 3. Trees; fully developed leaves more than 80 cm long; ripe fruits dark purplish maroon | 5. <i>D. steudneri</i> |
| - Trees or shrubs; fully developed leaves not more than 70 cm long; ripe fruits orange | 4 |
| 4. Usually producing several stems from a common base; inflorescence erect, not reflexed; perianth up to 10 mm long | 2. <i>D. ellenbeckiana</i> |
| - Usually one main trunk and many branches; inflorescence sharply reflexed; perianth 15 mm long | 1. <i>D. afromontana</i> |
-



*Dracaena
afromontana*

1. *Dracaena afromontana* Mildbraed

The specific epithet '*afromontana*' refers to the afromontane habitat in which the plant grows. The species was described by Mildbraed in 1914 from plants collected in Central Africa.

It differs from the related species, *D. ellenbeckiana* by the inflorescence, which is sharply reflexed, and by the longer perianth.

Description

Shrub or shrubby tree, sometimes straggling, 2–6(–10) m tall, main trunk up to 25 cm in diameter, branches arching, hollow when dry. Leaves shiny dark green, paler below, thinly leathery, dagger-shaped, 15–30 × 1.5–3 cm, acute. Inflorescence hanging, sharply reflexed, c. 20–40 cm long, axis about 5 mm in diameter. Flower pedicels 4–12 mm long, articulated c. 2 mm below the flower. Perianth 15 mm long, white, pale-green or with purple tinge outside, somewhat translucent and showing a single rib; tube c. 1 mm long,



Fig. 120.
*Dracaena
afromontana*,
from Masha
forest, Illubabor
floristic region.

lobes $14 \times 2-3$ mm. Ovary obovoid, 4×2.5 mm; stigma-lobes not well developed. Fruits orange, globose or two-three-lobed, $12-16 \times 12-20$ mm. Seeds dirty white, 6–9 mm in diameter.

Habitat and distribution

The species grows in moist undergrowth of montane forest, often along streams between 1750 and 2800 m in Tigray, Shewa, Harerge, Kefa, Illubabor and Wellega floristic regions. It also occurs in east Africa, west to eastern Zaire and south to Malawi. The main flowering period in Ethiopia is from January to April, and also from July to October.



Dracaena ellenbeckiana

2. *Dracaena ellenbeckiana* Engler

The specific epithet '*ellenbeckiana*' was given in honour of the collector of the type specimen, Ellenbeck. The species was described by Engler in 1902 from a plant collected from Sheikh Hussein in Bale floristic region.

It differs from the related species, *D. afromontana* by having erect inflorescence and shorter perianth

Description

Tree 3–8 m tall, usually producing several stems from a common base. Branches few, bark silvery gray showing a reticulate pattern of leaf scars, older stems longitudinally fissured. Leaves pale greyish green, up to 65×9 cm, acuminate. Inflorescence paniculate, erect, up to 80 cm long, with 2–3 racemose branches at each node, which



Fig. 121. *Dracaena ellenbeckiana*, from between Mega and Megado, Sidamo floristic region.

are up to 35 cm long; pedicels in fascicles (1–)2–7 together, up to 5 mm long, articulate at the top, supported by narrow triangular bracts as long as the pedicel and up to 1 mm wide. Perianth white, fused at the base for 2 mm, lobes about 8 mm long, translucent with a single rib. Ovary bottle-shaped, widest at the top; stigma very shallowly 3-lobed. Fruit orange-scarlet, globose to 3-lobed, 8–9 × 9–14 mm. Seeds globular, brown, about 6 mm in diameter.

Habitat and distribution

The species grows in rocky outcrops and on escarpments, in *Acacia-Combretum*, *Lannea* and *Combretum* bushland on reddish-brown loamy soil between 1300 and 1350 m in Sidamo, Bale, and Harerge floristic regions. It also occurs in Uganda, Kenya, and possibly in Somalia and the Sudan. The main flowering period in Ethiopia is from April to July.



Dracaena fragrans

3. *Dracaena fragrans* (L.) Ker Gawl.

The specific epithet '*fragrans*' refers to the attractive aroma produced by the flowers. The species was described by Linnaeus and transferred to *Dracaena* by Ker Gawler in 1808.

It differs from the rest of the species in the genus by having flowers arranged in multi-flowered heads.

Description

Rather weak shrubs, producing one to several whip-like stems, or branched trees, 1–15 m or taller, main trunk rarely more than 30 cm in diameter. Leaves bright green above, paler below, colour uniform or variegated (usually in cultivated plants), strap-shaped to narrowly oblanceolate, the widest part usually above the middle (12–)20–125(–150) × (1–)2–10(–12) cm, acute. Inflorescence simple or branched, erect to hanging, usually with a zig-zag axis, (15–) 20–100(–160) cm long. Flowers arranged in well separated, multi-flowered, spherical, stalked or sessile heads; pedicels 2–5 mm long, articulated at the top. Perianth white with some purple tinges on the outside, (15–)17–22(–25) mm long, receptacle obconical 1.5–3(–5) mm long; perianth tube (5–)8–10(–11) mm long, lobes (7–)9–11(–12) × 3 mm with a single rib. Ovary cylindrical to bottle-shaped, 2–3(–4) mm long; stigma 3-lobed. Fruits orange, depressed globose, 11–19 mm in diameter. Seeds white, globose to bean-shaped, 4–14 mm in diameter.

Habitat and distribution

The species grows in forests between 1200 and 1750 m in Illubabor, Kefa and Wellega floristic regions, sometimes also planted as a hedge. It is widespread in tropical Africa from Gambia and Ethiopia south to Angola and Mozambique. The main flowering period in Ethiopia is from December to January.

Fig. 122.
Dracaena
fragrans, from
between Godere
and Bebek,
Illubabor floristic
region.



4. *Dracaena ombet* Kotschy & Peyritsch

The specific epithet ‘*ombet*’ is a vernacular name of the species in the Bedani language of the Sudan. It was described by Kotschy and Peyritsch in 1867.

It differs from the rest of the species in the genus by having succulent leaves, about 1 cm thick.

Description

Tree (2–) 4–8 m tall, single trunk up to 40 cm in diameter, eventually branching into an umbrella-shaped crown, bark pale brown showing a dense annular pattern of leaf scars. Leaves congested at the ends of branches, gray to blue-green, up to 90×3 cm, very tough and thick, strongly red-brown tinged, upper surface flat to somewhat concave, lower surface convex to obscurely keeled; margins cartilaginous. Inflorescence an erect panicle to about 50 cm long, lower branches paniculate, upper ones racemose, glabrous, subtended by a series of bracts; pedicels paired to clustered, about 2 mm long and articulate

in the middle. Perianth white, 6 mm long including the 0.5 mm long tube. Ovary oblong; stigma shallowly 3-lobed. Fruits orange, globose, usually 1-seeded, 1 cm in diameter. Seed globose, 6 mm in diameter.

Subspecies key

1. Leaf margin smooth; end branches of the inflorescence glabrous. **a. subsp. ombet**
- Leaf margin scabrid; end branches of the inflorescence pubescent. **b. subsp. schizantha**



Dracaena ombet
subsp. *ombet*

Habitat and distribution

a. subsp. ombet

Tree up to 4 m tall. Leaves without a keel, crescent-shaped in cross section; margins smooth; basal part only twice as wide as long. Inflorescence glabrous throughout.

This subspecies differs from subsp. *schizantha* by the glabrous inflorescence.

The subspecies grows in open *Olea europaea* forest on limestone, and in semi-desert grassland with scattered *Acacia* scrub, in Tigray and Afar floristic regions in Ethiopia, and along the Red Sea coast of Eritrea, between 800 and 2100 m. It also occurs in Egypt and the Sudan. Fruiting specimens have been collected in October.



Dracaena ombet
subsp. *schizantha*

b. subsp. schizantha (Baker) Bos

The subspecific epithet '*schizantha*' refers to the deeply divided (*schiz*-) flowers (*-anthus*). The subspecies was described as *Dracaena schizantha* by Baker in 1877 from a plant collected from the Ahl and Serut mountains in Somalia by Hildebrandt. The species was later reduced to subspecies by Bos in 1997.

It differs from the related subspecies, subsp. *ombet* by having pubescent inflorescences (mainly towards the tip).

Description

Tree up to 8 m tall, old bark becoming very smooth, gray. Leaves generally narrow with a keel and rather triangular in cross section, margin distinctly scabrid, blade widened abruptly to a clasping base, 3–4 times as wide as long. Inflorescence with smaller branches minutely pubescent.

Habitat and distribution

The subspecies grows in mountain slopes, in *Acacia-Commiphora* bushland on limestone, and also in evergreen bushland dominated by *Buxus* and *Acokanthera* between 1000 and 1800 m in Sidamo, Bale, and Harerge floristic regions. It also occurs in Somalia, and possibly in Yemen. The main flowering period is from February to May.



Fig. 123.
Dracaena ombet
subsp. *ombet*
from Tigray
floristic region.



Dracaena steudneri

5. *Dracaena steudneri* Engl.

The specific epithet '*steudneri*' was given in honour of the German collector, Steudner, who collected the type specimen from Gonder floristic region. The species was described by Engler in 1895.

It differs from the related species, *D. ellenbeckiana* and *D. afromontana* by the ripe fruits being purplish maroon. In contrast, *D. ellenbeckiana* and *D. afromontana* have orange ripe fruits.

Description

Shrub to tall tree up to 15(–25) m tall, trunk 20–45 cm in diameter, with leaf scars remaining visible. Leaves leathery, shiny, bright to dark green, sword-shaped, up to 130 × 16 cm, base claspings, narrowing to 2–6 cm at 5–10 cm from the base, blade widest around the middle, upper part gradually tapering towards the acute tip,



Fig. 124. *Dracaena steudneri*, in cultivation in Blantyre, Malawi.

margin smooth. Inflorescence initially erect, eventually bending in fruit, panicate, up to $100(-200) \times 70-150$ cm wide with many perpendicular glabrous branches terminating in contracted multi-flowered racemes, pedicels 2.5 mm long, articulated at the top. Perianth greenish-white, 15 mm long including the 4 mm long tube, lobes translucent with a single rib. Ovary $3-4 \times 2$ mm. Fruits first bronze-coloured, later dark-purple to black-maroon with orange pulp, $15-20 \times 15-30$ mm. Seeds white, globose, 10 mm in diameter.

Habitat and distribution

The species occurs in relict forests and secondary forests between 1500 and 2000 m in Tigray, Gonder, Gojam, Shewa, Wellega, Kefa, Sidamo and Harerge floristic regions. It is often planted as an ornamental in gardens and parks. It also occurs in East Africa, west to eastern Zaire, south to Zimbabwe and Mozambique. The main flowering period in Ethiopia is from November to February.

2. SANSEVIERIA *Thunb.*

Evergreen perennial plants with thick and creeping cylindrical rhizomes. Leaves sessile, in clusters or 2 opposite ranks, erect or spreading, fleshy or thick and leathery, flat, channeled, half-cylindrical, cylindrical or laterally compressed, rigid, firm or flexible, often full of fiber. Inflorescence a raceme or panicle, simple or branched. Flowers solitary or 2 or more in a cluster, on pedicels that are jointed near the middle or at apex, the upper part of which is falling off with the flower. The flowers are often fragrant, and remain open only one day or night. Perianth with a distinct tube and 6 narrow lobes that are usually rolled back or spreading. Stamens 6, with slender thread-like filaments and versatile anthers. Ovary trilocular, with one ovule in each locule; styles slender, thread-like, about as long as the stamens. Fruit a berry, containing 1–3 stony seeds.

The genus includes about 50 species naturally occurring in the tropics and subtropics of the Old World, mostly in Africa. It is represented by 6 species in the Flora area and probably one or more introduced species cultivated in gardens and as pot plants.

Uses In many parts of Africa, the string is used for bows; hence the common name for the genus as ‘Bowstring Hemp’. A number of species are cultivated in various parts of the tropics for their valuable high quality fibers in terms of elasticity and strength. Among the known species in Ethiopia, *S. ehrenbergii* is harvested in large quantities followed by *S. forskaoliana*. Goats have been observed to browse on young leaves, while baboons, kudu and rhinoceros have been observed eating the older leaves.

Species of this genus are used as in-door and out-door ornamental plants both in the tropics and the temperate regions throughout the world, as they are easily propagated from cuttings. Usually the rhizomes are cut into pieces and planted. However, leaves which are planted whole or cut into small pieces also develop roots readily under moist conditions. Plants can also be grown from suckers or seeds.

Key to the species

1. Plants without easily seen aerial stems; leaves flat or if cylindrical, without a channel at the base 2
 - Plants with a short areal stem; leaves laterally compressed or cylindrical with a channel at the base 5
2. Leaves cylindrical 3
 - Leaves flat or nearly flat 4
3. Leaves solitary 3. *S. fischeri*
 - Leaves several together 4. *S. erythraeae*
4. Leaves with acute, brown, apical points and red-brown margins 6. *S. forskaoiana*
 - Leaves with soft green subulate points and green margins 5. *S. nilotica*
5. Stem up to 10 cm high, branching at or near the ground, leaves channelled for about 2 cm at the base, otherwise cylindrical 2. *S. phillipsiae*
 - Stem up to 23 cm high, not branching, leaves laterally compressed, with a channel throughout their length 1. *S. ehrenbergii*



*Sansevieria
ehrenbergii*

1. *Sansevieria ehrenbergii* Schweinf. ex Baker

The specific epithet '*ehrenbergii*' refers to the German botanist Ehrenberg.

The name was proposed by Schweinfurth, and the species was formally described by Baker in 1875 from a plant collected in the Sudan.

It differs from the related species, *S. phillipsiae*, by the leaves being laterally compressed and channeled throughout their length. In contrast, *S. phillipsiae* has leaves cylindrical and channeled only for about 2 cm from base.

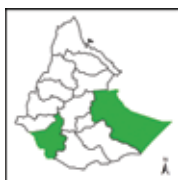
Description

Xerophytic plants with stems up to 25cm tall, usually concealed by leaf bases. Leaves 5–9, crowded, 2-ranked, erect or more or less spreading fan-wise, up to 1m or more long, laterally compressed, with flattened sides, rounded on the back, tapering upwards, rather abruptly ending in a stout hard spine-like point about 2 cm long; margins reddish-brown, with white membranaceous edges which get wider than the rest of the leaf at the base. Inflorescence a panicle up to 2 m long, much branched in the upper ¾ of its length; branches up to 25 cm or more long, curved, ascending, the lower ones branched again, the upper ones simple. Flowers 4–7 in a cluster, pedicels 2–4

mm long; perianth purple to white, tube 5–6 mm long. Fruits green, spherical, turning orange at maturity.

Habitat and distribution

The species grows on rocky ground, under shade or in the open in *Acacia-Combretum* woodland between 400 and 1100 m in Shewa, Kefa, Gamo Gofa, Sidamo and Harerge floristic regions in Ethiopia, and in Eritrea. It also occurs in Arabia, Djibouti, Kenya, Somalia, Sudan, and Tanzania. The main flowering period in Ethiopia is from April to June.



Sansevieria phillipsiae

2. *Sansevieria phillipsiae* N.E.Br.

The specific epithet '*phillipsiae*' was given in honour of Lort-Phillips who collected the type specimen from Somalia. The species was described by N.E. Brown in 1913.

It differs from the related species, *S. ehrenbergii*, by the leaves being cylindrical and channeled only for about 2 cm from base. In contrast, *S. ehrenbergii* has leaves laterally compressed and channeled throughout their length.

Description

Dwarf plants with short, c. 10 cm, erect stems branching at or above ground level, and forming irregular clumps. Branches c. 20 × 1.5 cm, spreading on the ground and ultimately rooting, ending in a tuft of leaves; margin with a membranaceous white edge to a narrow brown border, withering to whitish-brown. Leaves 5–10 together, slightly recurved, rigid, smooth, up to 45 cm long, channeled for about 2 cm at the sheathing base, otherwise cylindrical and gradually tapering to an acuminate apex with a spine-like tip; surface covered with minute, irregular transverse ridges, young leaves with paler bands, older uniformly dark green. Inflorescence a spike-like raceme about 46 cm long and minutely white mottled. basal part bearing 2–3 brown membranaceous, lanceolate bracts, 1–3 cm long, acuminate at the apex. Flowers white, 2–6 in a cluster, upper clusters with fewer flowers than the lower; pedicel c. 3 mm long. Perianth up to 40 mm long; tube up to 30 mm long, slender, cylindrical, not enlarged at the base; lobes linear, up to 20 mm long. Stamens 15 mm long. Ovary cylindrical, 3 mm long; style exerted, slightly longer than the stamens.

Habitat and distribution

The species grows in the shade of trees, *Acacia*, *Commiphora*, and *Combretum*, on sloping areas and along road sides between 1250 and 1450 m in Kefa, Gamo Gofa, and Harerge floristic regions. It also occurs in Somalia. The main flowering period in Ethiopia is in August.

*Sansevieria fischeri*

3. *Sansevieria fischeri* (Baker) Marais

The specific epithet '*fischeri*' was given in honour of *Fischer*, who collected the type specimen from East Africa. The species was described as *Boophane fischeri* by Baker in 1898, and transferred to *Sansevieria* by Marais in 1986.

It differs from the related species, *S. erythraeae*, in having solitary leaves.

Description

Plant without an aerial stem. Leaves solitary, erect, rigid; cylindrical, 45–160(–240) × 2–5 cm, slightly tapering upwards; apex suddenly narrowed to a stout white spine-like tip; outer surface with 4–6 furrows on the sides and back, which extend from base to apex, and a narrow concave channel all along above; surface slightly rough, marked with numerous closely placed transverse pale green bands, not always seen in older leaves. Inflorescence a spike-like raceme. Free parts of tepals 5–13 mm long, linear, obtuse; tube 20–50 mm long. Fruit not seen.

Habitat and distribution

Habitat unknown; but the only specimen seen was collected along a river in Bale floristic region. It also occurs in Kenya, Somalia and Tanzania.

*Sansevieria erythraeae*

4. *Sansevieria erythraeae* Mattei

The specific epithet '*erythraeae*' refers to the fact that the plants in Palermo Botanic Gardens in Sicily, from which the species was described by Mattei in 1918, originated from Eritrean seed material.

It differs from the related species, *S. fischeri*, in having 6–8 leaves. In contrast, *S. fischeri* has solitary leaves.

Description

Plant without an aerial stem, growing in patches. Leaves 6–8 together, irregularly arranged, cylindrical, pointed, erect, 40–50 cm long, with a short channel above and 5 furrows or grooves on the outside. Inflorescence a leafy raceme, almost as tall as the leaves; bracts membranaceous, ovate-lanceolate, acute. Flowers in clusters of 3–5, white, sweet smelling; pedicel 7–8 mm long, slender. Perianth tube 5–7 mm, narrow; lobes linear, subobtusate, revolute. Fruit not seen.

Habitat and distribution

The species grows along river sides in semi-arid areas between 1200 and 2100 m in Eritrea. It probably also occurs in the Sudan.

*Sansevieria nilotica*

5. *Sansevieria nilotica* Baker

The specific epithet '*nilotica*' refers to the White Nile river, on the banks of which the type specimen was collected by Murie. The species was described by Baker in 1875.

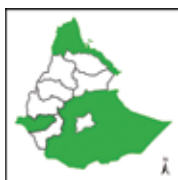
It differs from the related species, *S. forskaoliana* by the leaves being subulate at the apex and green at the margin. In contrast, *S. forskaoliana* has leaves which are acute at the apex and brown at the margins.

Description

Plant without an aerial stem. Leaves 2–3 together, when well developed up to 125×4 cm, strap-shaped, with margins quite parallel, narrowing above into a soft green subulate point up to 2 cm long and gradually narrowing at the base into a deeply concave channel, smooth, conspicuously marked with numerous, narrow, closely placed, irregular, zigzag, transverse pale and dark green bars; margins green. Inflorescence a raceme up to 200 cm tall. Flowers white, in clusters, 4–10 in the lower and 2–3 in the upper clusters; pedicels up to 12 mm long. Perianth tube c. 10 mm long; lobes c. 12 mm long, linear, subacute. Fruit not seen.

Habitat and distribution

The species grows in riverine forest, associated with *Ficus vallis-choudae*, *Celtis* sp., and *Argomuellera macrophylla*, between 900 and 1450 m in Illubabor and Kefa floristic regions. It also occurs in the Sudan, Uganda, and Central Africa. The main flowering period in Ethiopia is from December to January.

*Sansevieria forskaoliana*

6. *Sansevieria forskaoliana* (Schult. f.) Hepper & Wood

The specific epithet '*forskaoliana*' was given in honour of Forsskål, who collected the type in North Yemen. The species was described as *Smilacina forskaoliana* in 1829. The species was transferred to *Sansevieria* by Hepper and Wood in 1984.

It differs from the related species, *S. nilotica*, by the leaves being acute at the apex and brown at the margins. In contrast, in *S. nilotica* the leaves are subulate at the apex and green at the margin.

Description

Plant without an aerial stem; rhizome 2 cm or more in diameter. Leaves 1–2(–4) together, usually erect, firm, up to 100×9 cm, sometimes longer, lanceolate, acute, with a hardened apical point 0.2 cm long or more, brown, fading to white later on, narrowed from

the middle into a stout concave-channelled base, margins mostly wavy with hardened, 1 mm wide reddish-brown edges, rough with fine transverse ridges or entirely smooth on both sides; surface green, mottled and speckled whitish green or without markings. Inflorescence 95 cm or more high; peduncle 1 cm or more thick at the base, with 5–6 ovate-lanceolate, acute or acuminate sheaths on the lower half, and flower-clusters occupying the upper half. Flowers up to 4 in a cluster, pedicels up to 10 mm long. Perianth white. Fruit 6–13 mm in diameter (dried), 1–3seeded, pale to dark green ripening to orange or red.

Habitat and distribution The species grows in a wide range of habitats in dry areas including rocky places, *Combretum* woodland with tall grasses, riverine vegetation, between 550 and 2000 m in Shewa, Illubabor, Gamo Gofa, Sidamo, Bale, and Harerge floristic regions in Ethiopia, and in Eritrea. It also occurs in Djibouti, Somalia, Kenya, Sudan, and Congo. The main flowering period in Ethiopia is from May to August.

ASPARAGACEAE

The family consists of erect or scandent herbs, subshrubs or shrubs. The rhizomes are sympodial and the roots often swollen and fusiform. The leaves are normally reduced and scale-like, the assimilating function taken over by modified green branches (cladodes). In some genera, the branches are transformed into leaf-like cladodes (phylloclades). The flowers are unisexual or bisexual, solitary assembled in racemes or umbel-like inflorescences. The perianth with 6 tepals in two series, are similar in shape, free or fused at the base, white, yellow or green. The 6 stamens are found both in unisexual and bisexual flowers, but are not functional in the female unisexual flowers. The ovary is superior, three-locular with 2-12 ovules in each locule, in axile placentation. The styles are short with capitate or lobed stigma. The fruits are globose with 1-2(-3) black seeds.

The family includes only one genus, *Asparagus*, with a controversial number of species (170-300), distributed throughout Africa and most of Europe, Asia, and Australia. The genus is divided in two subgenera: subgenus *Asparagus* and subgenus *Myrsiphyllum*.

ASPARAGUS L.

The genus includes erect or scandent branching shrubs or subshrubs. Spines are commonly present, rarely absent, when present these are formed from the reduced leaves. The cladodes are solitary or fascicled, subulate, more or less linear and the phylloclades are flattened. The phylloclades are bilateral and anatomically rather leaf-like, while the cladodes are usually needle-like and radial, both types are supplied with several or one single vascular bundle. Three different kinds of spines are observed in *Asparagus*: indurated modified leaf stipules, as seen in all of the Ethiopian species, e.g. *Asparagus africanus*; the indurated pungent cladodes as shown in

A. horridus (not in Ethiopia), and the short spines from the main stem or on branches as shown in *A. suaveolens* from East and southern Africa. The inflorescences are axillary or terminal. The flowers are erect with stamens fused to the perianth segments. Ovary 2–3 locular with 1–10 ovules in each locule. Fruit a berry, globose, usually red or white flushed purple when mature.

Distribution and classification Nine species in two subgenera are known to occur in Ethiopia and Eritrea, but two extra are included (*A. aspergillus* and *A. buchananii*) as they are found close to the border and are thus expected to occur in Ethiopia. Two species, *A. officinalis* L., a non-spiny plant with unisexual flowers and *A. aethiopicus* L. cultivar '*Sprengeri*' (*A. sprengeri* Regel) characterised by the drooping, loose and spreading branches are known in cultivation.

Reproduction The flowers of many species are open and unspecialized. They produce nectar and sometimes a strong scent, which strongly suggests pollination by insects. But so far the pollination process has not been documented. The berries are certainly bird dispersed.

Use The most commonly cultivated species for its edible young shoots is *A. officinalis* which is available in most super-markets throughout the world. The species has been cultivated since ancient Greek times. Some species are cultivated as ornamental plants.

Conservation Among the indigenous species, only one, *A. leptocladodius* is near-endemic, occurring in Bale and Sidamo floristic regions in Ethiopia and adjacent areas in Kenya, Somalia, and Djibouti. None of the *Asparagus* species seem to be threatened so far.

Key to subgenera

1. Cladodes subulate, linear or filiform; flowers usually erect, rarely pendulous; filaments free 1. subgen. *Asparagus*
 - Cladodes flattened, leaf-like (phylloclade); flowers pendulous; filament connivent, forming a tube around the ovary. 2. subgen. *Myrsiphyllum* (12. *A. asparagoides*)
-

Key to species of subgenus Asparagus

1. Flowers solitary or fasciculate 2
- Flowers in racemose or umbel-like, condensed inflorescences 5
2. Inflorescence axillary and/or terminal, 2–10 flowers in a cluster; perianth white; ovary 3-locular with 5–8 ovules in each locule 3
- Inflorescence axillary, flowers solitary or 2 in a cluster; perianth pink, purple or white; ovary 3-locular with 1 ovule in each locule 4. *A. flagellaris*
3. Young branches with ridges, scabrid; final branches and cladodes not in the same plane; cladodes subulate, thick; flowers axillary and/or terminal, 3–10 together; berry 4–6 mm in diameter 4
- Young branches without ridges, smooth; final branches and cladodes in the same plane; cladodes fine; flowers usually terminal, 2–3 together; berry 7–10 mm in diameter 3. *A. setaceus*
4. Terminal branches glabrous to puberulous, commonly without spines; cladodes 3–12 mm long, rounded or angled, stiff; perianth segments 4–5 mm long 1. *A. africanus*
- Terminal branches glabrous and always with spines; cladodes 15–26 mm long, flattened or with grooves above, flexible; perianth segments c. 3 mm long 2. *A. scaberulus*
5. Cladodes subulate or only slightly flattened, 8–35 × <1 mm 6
- Cladodes linear, flattened, 15–85 × 1.25–2.5 mm 9
6. Racemes branching or umbel like; pedicels 1–2 or more terminally, articulated in the middle or below 7
- Raceme simple, not branching; pedicel solitary, articulated above the middle or just below the perianth 8
7. Flowering branches commonly with cladodes; racemes 2–6, elongate, lax, 1.5–10 cm long; flowers persistent on pedicels 8. *A. racemosus*
- Flowering branches without cladodes; racemes 1(–2), condensed, umbel-like, 1–2.5 cm long; flowers easily fall off from the pedicels 9. *A. leptocladodius*
8. Young branches grey, scabrid to puberulous; pedicels 1.5–2.5 mm long; ovary with style 0.75–1 mm long; anthers black 10. *A. aspergillus*
- Young branches pale brown, glabrous, smooth; pedicels 2–5 mm long; ovary with style c. 0.5 mm long; anthers cream to yellowish 11. *A. buchananii*
9. Branches glabrous; cladodes 15–90 × 2–5 mm with distinct mid vein 5. *A. falcatus*
- Branches glabrous to puberulous; cladodes 15–45 × 1–2 mm with mid vein indistinct 6. *A. aridicolus*

9. Cladodes (25–)30–105 mm long, 2.5–5 mm wide, mid-vein distinct 5. *A. falcatus*
 - Cladodes 10–25 mm long, 0.5–2 mm wide, mid-vein indistinct 10
10. Young branches smooth, not striated; Inflorescence simple racemes; outer perianth segments entire, not ciliate; fruit 5–7 mm in diameter 6. *A. aridicolus*
 - Young branches striated; inflorescence modified branchlets; outer perianth segments ciliate; fruit 9–10 mm in diameter 7. *A. natalensis*

*Asparagus africanus*

1. *Asparagus africanus* Lamarck

The specific epithet '*africanus*' refers to the species being known from the African continent. The species was described by Lamarck in 1783 from plants collected in the Cape Region in South Africa by Sonnerat.

This is one of the most common species and it is easily recognised by the rounded or angled stiff cladodes, the terminal branches commonly lacking spines and the fasciculate flowers with whitish tepals.

Description

Erect, scrambling or climbing or shrub up to 5 m. Branches glabrous to puberulous, terete to angled, with spines 3–5 mm long; terminal branches without spines. Cladodes fasciculate, 5–25, subulate, stiff, 3–10(–15) mm long. Flowers fasciculate, 2–10, axillary and terminal; pedicels 3–8 mm long, articulated below the middle. Bracts lanceolate, c. 1.5 mm long, falling off quickly. Perianth white, ± equal, 4–5 mm long, entire. Stamens shorter than the perianth; anthers yellow. Ovary 3-locular with 6–8 ovules in each locule, with a 1 mm long 3-branched style. Berry red, 5–6 mm in diameter, one-seeded. Seeds c. 4 mm in diameter, smooth, with reticulate surface.

Habitat and distribution

The species grows in *Acacia* woodland, secondary forest and forest margins (and as hedgerows) between 1450 and



Fig. 125.
Asparagus africanus from Shewa floristic region.

3800 m, and it is widespread in Ethiopia and Eritrea. It is also common from the Sudan and Somalia to South Africa, and occurs in Arabia to India. The main flowering period in Ethiopia is from February to May, also from October to December.



Asparagus scaberulus

2. *Asparagus scaberulus* A. Richard

The specific epithet '*scaberulus*' refers to the short curved spines on the surface of the branches that are rough to touch. The species was described by A. Richard in 1851 from plants collected in Tigray floristic region by the French collector, Quartin-Dillon.

The species is related to the widespread *A. africanus*, but easily distinguished by the flexible longer cladodes,



Fig. 126.
*Asparagus
scaberulus* from
Sidamo floristic
region.

the terminal branches with spines, and flowers with smaller sized white tepals (c. 3 mm long).

Description Erect to climbing shrub to 2 m high. Branches glabrous, terete, smooth or lined with spines 1–3 mm long, curved downwards, seen also in the terminal branches. Cladodes fasciculate, 2–25(–35) together, flexible or straight, 13–26 mm long, flattened, angled, sometimes forming grooves on the upper side. Flowers fasciculate, 3–6 together, axillary or terminal; pedicel 5–8 mm long, articulated at the middle or below. Tepals white, c. 3 mm long. Stamens shorter than the perianth; anthers yellow. Ovary 3-locular with 5 ovules in each locule; style 1 mm long with 3-branched stigma. Bracts ovate, c. 1 mm long, membranaceous. Fruit 4–5 mm in diameter with one seed

Habitat and distribution The species grows in *Acacia-Commiphora* woodland, between 400 and 1500 m in Tigray, Gonder, Kefa, Gamo Gofa, Sidamo, and Bale floristic regions in Ethiopia and in Eritrea. It also occurs in Somalia, Kenya, Tanzania, and Arabia. The flowering period in Ethiopia is from February to June; sometimes also from October to December.



Asparagus setaceus

3. *Asparagus setaceus* (Kunth) Jessop

The specific epithet ‘*setaceus*’ refers to the bristle-like fine cladodes. The species was described by Kunth in 1850 as *Asparagopsis setacea* from a collection made in South Africa by Drege. It was transferred to the genus *Asparagus* by Jessop in 1966. It is also known by the name *A. plumosus*.

The species is easily recognised by the fine bristle-like cladodes which are arranged in one plane. However, it can sometimes be confused with *A. africanus*, from which it is distinguished by the shorter perianth segments c. 3 mm long and the larger berry, 7–10 mm long. In contrast, *A. africanus* has longer perianth segments, 4–5 mm long and a smaller berry, 4–6 mm in diameter.

Description Climbing shrub to 6 m high. Branches 4x branching, glabrous, terete or grooved with spines 2–7 mm long, mainly on the main branches; terminal branches resemble a short stalk, where the flowers are borne. Cladodes fasciculate, 3–25 together, linear, fine, 3–10 mm long; final branches and cladodes arranged in the same plane. Flowers solitary or fasciculate, 2–3 together on terminal branches (rarely some flowers seen also in an axillary position); pedicels 3–8 mm long, articulated at the middle or below. Bracts minute, falling more or less quickly. Perianth segments white, ± equal, c. 3 mm long. Stamens shorter than the perianth; anthers yellow. Ovary 3-locular,

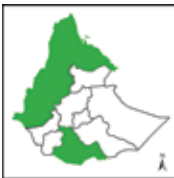
Fig. 127.
Asparagus
setaceus,
cultivated plant,
Addis Ababa.



with 6–8 ovules in each locule; style 1 mm long, 3-branched. Fruit red, 7–8(–10) mm in diameter, with 1–3 seeds.

Habitat and distribution

The species grows in forests and forest margins between 500 and 2400 m in Shewa, Bale, Kefa, Illubabor and Wellega floristic regions, in areas with relatively high rainfall. The species also occurs through eastern Africa south to South Africa. In Ethiopia the species flowers almost throughout the year, but mainly from January to May and from September to December.



Asparagus flagellaris

4. *Asparagus flagellaris* (Kunth) Baker

The specific epithet '*flagellaris*' refers to the whip-like (*flagellum*) cladodes. The species was described by Kunth in 1850 as *Asparagopsis flagellaris* from plants collected in Senegambia. It was transferred to *Asparagus* by Baker in 1875. The species has also been known under the names *A. schweinfurthii* and *A. abyssinicus*.

The species is easily recognised from other species in the area by the purplish stems with hooked spines, and the solitary or paired white flowers with a purplish tinge.



Fig. 128. *Asparagus flagellaris*, (left) vegetative plant from Wellega floristic region, (right) flowering specimen.

Description

Erect shrub to 2 m high. Branches glabrous, terete or grooved, smooth to lined with spines 2–4 mm long, straight or curved, seen also on terminal branches. Cladodes fasciculate, 1–8 together, subulate, stiff, 5–20(–60) mm long. Flowers axillary, solitary or paired; pedicels 5–10 mm long, articulated below the middle, sometimes near the base. Perianth white to purple (pink), $\pm$ equal 2.5–3 mm long. Stamens shorter than the perianths. Ovary 3-locular with 1–2 ovules in each locule; style *c.* 1 mm long, slender and 3-branched stigma. Fruit orange red, 5–7 mm in diameter with 1 (sometimes 3) seeds. Seeds black, rounded, rugose.

Habitat and distribution

The species grows in *Acacia-Commiphora*, *Combretum-Terminalia*, and *Teclea-Acokanthera* woodland between 650 and 1800 m in Tigray, Gonder, Gojam, Wellega, Illubabor, and Sidamo floristic regions in Ethiopia and in Eritrea. It also occurs in Somalia, Sudan, Uganda, Kenya, Tanzania, Zaire, Central African Republic to W. Africa. The main flowering period in Ethiopia is from January to June and from October to December.



Asparagus falcatus

5. *Asparagus falcatus* L.

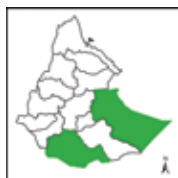
The specific epithet '*falcatus*' refers to the curved or sickle-shaped cladodes. The species was described by Linnaeus in 1753 from a plant collected in Sri Lanka (Ceylon) by Burmann.

The species is easily recognised from the related species, *A. aridicola*, by the thin and flexible cladodes

with a midvein. In contrast, *A. aridicola* has cladodes that are rigid and without a mid-vein.

Description Climbing shrub to 4 m long or more. Branches glabrous with smooth, terete to angled stem. Spines 1–12 mm long, recurved, seen also on the terminal branches. Cladodes fasciculate, 3–6 together, flattened, straight or falcate, with a distinct mid-vein, (15–)25–90 mm × 2–4 mm. Inflorescence racemose, 1.5–5 cm long, solitary or fasciculate, 2–4 together, glabrous, unbranched; pedicels 3–3.5 mm long, articulated at the middle or above. Perianth parts broadly elliptic or obovate, c. 3 mm long, white to cream or yellowish. Stamens shorter than the perianth; anthers yellow. Ovary 3-locular with 6 ovules in each locule; style short, c. 0.5 mm long including the stigma. Berry red or white flushed purple, about 7 mm in diameter with 1–3 seeds.

Habitat and distribution The species grows in forest edges between 1200 and 1310 m in Kefa floristic region. The species also occurs in Somalia, Kenya, Tanzania, south to South Africa, and in Asia. The main flowering period in Ethiopia is from September to October.



Asparagus aridicola

6. *Asparagus aridicola* Sebsebe

The specific epithet ‘*aridicola*’, meaning arid dwelling, refers to the dry climate where the species grows. It is described formally in the Flora of Tropical East Africa in 2004. In the Flora of Ethiopia and Eritrea (1997) the species was referred to *A. falcatus* var. *ternifolius* (Baker) Jessop.

The species is easily recognized from the related species *A. natalensis* by the simple raceme inflorescence, pedicels articulated above the middle, below the perianth and outer perianth segments entire at the margin. In contrast, in *A. natalensis*, the inflorescence is a modified branchlet, pedicels articulated below the middle and outer perianth segments ciliate at the margin.

Description Climbing or scandent shrub to 2.5–3 m high. Branches glabrous to puberulous, angled when young, becoming terete with age, with spines below the cladodes, 3–7 mm on main branches and c. 1 mm long on terminal branches. Cladodes solitary or fasciculate, 2–6 in a cluster, 15–25 × 1–3 mm, acute at the apex, attenuate at the base. Inflorescences 1.5–15 cm long. Flowers in fascicles of 2–6 flowers. Pedicel 3–14 mm long articulated above or below the mid. Perianth white, c. 3 mm long, smooth to ciliate at the margin. Stamens included in the perianth. Ovary 3-locular with 4–6 ovules in each locule. Fruit red, globose 7–9 mm in diameter, with one seed.

Fig. 129.
Asparagus
aridicola, from
Sidamo floristic
region.



**Habitat and
distribution**

The species grows in *Acacia-Commiphora-Combretum* woodland, wooded grassland, mixed deciduous woodland on sandy soil and limestone between 1100 and 1900 m in Gamo Gofa, Sidamo, and Harerge floristic regions. It also occurs in tropical Africa south to South Africa, and from Arabia to India. The main flowering period in Ethiopia is from April to June and also from October to December.

**7. *Asparagus natalensis* (Baker) Fellingham &
N. L. Mey.**



Asparagus natalensis

The specific epithet '*natalensis*' refers to Natal, in South Africa, from where the type of the species was collected by Medley Wood. The taxon was first described by Baker as a variety of *Asparagus aethiopicus* L. in 1896.

The species is easily recognized from the related species *A. aridicola* by the inflorescence being a modified branchlet, pedicels articulated below the middle and outer perianth segments ciliate at the margin. In contrast, in *A. aridicola* the inflorescence is simple raceme, pedicels articulated above the middle, below the perianth and outer perianth segments entire at the margin.

A. aridicola is related to *A. natalensis*. However, *A. aridicola* is distinguished by the simple raceme inflorescence, pedicels articulated above the middle, below the perianth and outer perianth segments entire at the margin. In contrast, in *A. natalensis*, the inflorescence is a modified branchlet, pedicels articulated below the middle and outer perianth segments ciliate at the margin.



Fig. 130. *Asparagus natalensis*, from Mega, Sidamo floristic region.

Description Plants climbing or scandent shrub to 2.5–3 m high. Branches glabrous to puberulous, striated when young. Spines 5–8 mm on main branches; spinules below the flowers 1–4 mm long. Cladodes solitary, or fasciculate 2–6 in a cluster, $15\text{--}25 \times 1\text{--}3$ mm. Inflorescences (modified flowering branchlets often with cladodes or compound racemes), 1.5–15 cm long. Flowers in fascicles of 2–6; pedicel 3–4 mm long, articulated in the middle or below. Perianth white to cream, c. 3 mm long, outer segments ciliate at the margin. Fruit globose, 9–10 mm in diameter, red, 1-seeded.

Habitat and distribution The species occurs in open *Acacia-Commiphora* woodland, mixed deciduous woodland with species of *Acacia*, *Tarchonanthus camphoratus* and *Barbeya oleoides*, edge of evergreen scrub between 1100 and 1900 m. It is recorded from Gamo Gofa, Sidamo and Harerge floristic regions. It is otherwise found in Somalia, Kenya, Uganda extending to Natal in South Africa. The main flowering period in Ethiopia is from February to May and also possibly in October to December.



Fig. 131. *Asparagus racemosus*, from Bale floristic region.



Asparagus racemosus

8. *Asparagus racemosus* Willdenow

The specific epithet '*racemosus*' refers to the racemose inflorescence. The species was described by Willdenow in 1799 from material he had collected in India. The species is distinguished from other indigenous species with racemose inflorescences by the elongate lax racemes, 1.5–10 cm long, and by the persistent flowers on the pedicels that are articulated in the mid or below.

Description Climbing shrub to 7 m high. Branches terete, lined or angled, glabrous with spines 2–3 mm long in young parts, to 5–8 mm long in older. Cladodes fasciculate, 2–6 together, subulate to flattened, 8–35(–40) × 0.5–0.7 mm. Inflorescence racemose 1.5–17 cm long, glabrous; racemes solitary or fascicled; pedicel 4–6 mm long (elongating to 10 mm long in fruit), articulated at the mid or below. Bracts ovate, concave, 2.5–4 mm long, glabrous, membranous, sometimes falling quickly. Perianth greenish white to white, (3–)4–5 mm long. Stamens shorter than the perianth parts; anthers orange to red. Ovary obovate 3-locular, 6–7 ovules in each locule; style c. 1 mm long with a 3-branched stigma. Fruit green, turning red at maturity, 8–10(–13) mm in diameter, commonly with one, rarely 2–3 seeds.

Habitat and distribution The species grows in forests, valley bottoms, and along streams, between 1350 and 3100 m in Tigray, Gonder, Gojam, Kefa, Shewa, Arsi, Wellega, Sidamo, Bale, and

Harerge floristic regions in Ethiopia and in Eritrea. It also occurs in the Sudan, Somalia, Kenya, Tanzania, Mozambique, Angola, and Asia. The main flowering period in Ethiopia is from October to December and also occasionally in June.



*Asparagus
leptocladodius*

9. *Asparagus leptocladodius* Chiovenda

The specific epithet '*leptocladodius*' refers to the slender (*lepto-*) shoots (*-cladus*). The species was described by Chiovenda in 1940 from plants collected at Mt. Elliot in Bale floristic region by Reghini. It is easily distinguished from related species with racemose inflorescence by the flowering branches without cladodes; by the umbellate, condensed, 1–2.5 cm long racemes, and by the flowers easily falling off the pedicels, which are articulated in the mid or below.

Description

Erect or scandent shrub to 2 m high. Branches glabrous to puberulous, terete, white with erect spines 4–12 mm long. Cladodes fasciculate, 2–15 together, flattened, arcuate, 10–60 mm long, triangular. Raceme 0.5–2 cm long, often condensed and reduced, giving impression of an umbel. Pedicel 5–6 mm long, articulated in the middle or below. Bracts ovate, 1–1.5 × 0.5 mm, white, falling quickly. Perianth white, ± equal, 3–4 mm long. Stamens shorter than the perianth; anthers black. Ovary 2–3-locular with 6–8 ovules



Fig. 132. *Asparagus leptocladodius*, from near Sof Omar, Bale floristic region.

in each locule; style 0.3–0.7 mm long with 2–3 branched stigma. Fruit red, 6–9 mm in diameter with one seed, black, 4–5 mm in diameter.

Habitat and distribution

The species grows in *Acacia-Commiphora* woodland between 1500 and 1620 m in Sidamo and Bale floristic regions. It also occurs in Kenya, Djibouti, and Somalia. The main flowering period in Ethiopia is from October to December.



Asparagus aspergillus

10. *Asparagus aspergillus* Jessop

The specific epithet '*aspergillus*' refers to the brush-like cladodes similar to the brush used for spraying water in the Roman-Catholic Church, a name that also is used for a microscopic fungus which produces spores in brush-like structures. The Latin word, '*aspergere*' means in fact to 'spray liquid'. The species was described by Jessop in 1966 from plants collected in Transvaal in South Africa.

The species resembles *A. racemosus*, but is easily distinguished by the articulation of the pedicel at the apex, by the anthers being black at maturity, and by the 2–3 mm long perianth. It also resembles *A. buchananii* in having a simple raceme, solitary pedicels which are articulated above the middle or just below, but it is easily distinguished by its young branches being grey, scabrid to puberulous, by their pedicels being 1.5–2.5 mm long; and by the black anthers.

Description

Climbing or erect herb or shrub to 2 m. Branches glabrous to scabrid, pale grey, with spines 8–10 mm long on main branches, 3–4 mm long on terminal branches. Cladodes fasciculate, subulate, 10–20 mm long and <0.5 mm in thickness, absent during the flowering period. Bracts ovate, c. 1 mm long. Raceme solitary or in fascicles of 2–4, 12–45 mm long, scabrid; pedicels solitary, 1.5–3.5 mm long, articulated at the apex. Perianth oblong to obovate, c. 3 mm long, ± equal. Stamens 6, slightly shorter than the perianth parts; anthers black. Ovary 3-locular with 4–6 ovules in each locule; style 0.75–1 mm long, 3-branched. Berry red, globose, c. 6 mm in diameter, 1–2-seeded.

Habitat and distribution

The species grows in open *Acacia-Commiphora* woodland at c. 1600 m on red sandy soil in Sidamo floristic region. It also occurs in Kenya, Somalia, and it extends south to South Africa. The main flowering period is in December.



*Asparagus
buechananii*

11. *Asparagus buechananii* Baker

The specific epithet '*buechananii*' is given in honour of the collector, Mr *Buechanan* from whose collection the type of the species was designated. The species was described by Baker in 1893 from a plant collected from Malawi.

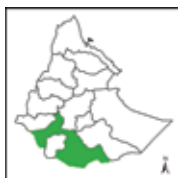
It resembles *A. aspergillus* on account of having a simple raceme, solitary pedicels which are articulated above the middle or just below, but easily distinguished by the young branches that are pale brown, glabrous, smooth; pedicels 2–5 mm long; ovary with style c. 0.5 mm long and anthers cream to yellowish.

Description

Climber, commonly to 5 m high or sometimes longer. Branches glabrous, pale brown, smooth, shiny with spines on main branches 1–4 cm long, dorsally flattened towards the base. Cladodes fasciculate, 3–5 together, subulate, 10–17(–27) mm long. Bracts ovate, 0.5–2 mm long. Racemes solitary or in fascicles of 2–3, 1.5–4 cm long, glabrous; pedicels solitary or 2 together, 2–5 mm long, articulated at the apex or sometimes at the middle. Perianth white to cream, elliptic to obovate, 2–3 mm long. Stamens shorter than the perianth parts; anthers yellow. Ovary 3-locular, obovate with 6–8 ovules in each locule; style c. 0.5 mm long with 3-branched stigma. Fruit red, c. 5 mm in diameter, 1–2seeded.

Habitat and distribution

Asparagus buechananii is found in forest or wet savanna. It occurs in southern Sudan, northern Kenya, northern Uganda to South Africa, and Angola. The species is not yet recorded within Ethiopia, but due to its wider distribution in the region and its occurrence in Southern Sudan, not far from the Ethiopian border, it is expected to occur in Kefa, floristic region in SW Ethiopia, and hence it is included here.



*Asparagus
asparagoides*

12. *Asparagus asparagoides* (L.) Wight

This species is called 'Smilax of florists' in English. The specific epithet '*asparagoides*' refers to its resemblance or similarity to the genus *Asparagus*, as the species was first described under a separate genus, *Medeola*. The species was described by Linnaeus in 1753 as *Medeola asparagoides* from a plant cultivated in Horti Pisani. Later it was transferred to the genus *Asparagus* by Wight in 1909.

It is distinguished from other species of the genus by the characteristic flattened, leaf-like cladodes

(phylloclades), pendulous flowers on long pedicels and connivent filaments that form a tube around the ovary.

Description Climbing or suberect annual herb to 3 m high. Branches glabrous, terete or angled, without spines. Cladodes broadly ovate to lanceolate, 1.2–4.5 × 0.7–2.7 cm acute at the apex, rounded at the base, with numerous (>15) parallel lateral veins. Racemes solitary or 2 together; pedicel 5–22 mm long, articulated above the middle or near to the base of the perianth. Bracts ovate, membranaceous, c. 3 mm long. Perianth greenish white, 5–6 mm long with purplish veins. Stamens 6, c. 6 mm long, shorter than the perianth, with white filaments and orange anthers. Ovary 3-locular with 4–6 ovules in each locule; style 2–3 mm long without distinct stigma lobes (not branched). Fruit red, globose, 6–10 mm in diameter, up to 8-seeded.

Habitat and distribution The species grows in secondary scrub and in dry juniper forest and in gallery forest between 1900 and 2480 m in Kefa and Sidamo floristic regions. It also occurs in tropical Africa and extends to the warmer parts of Europe. In recent years it has become naturalised in Australia. The common flowering period in Ethiopia is from January to June, also in October to December.

DIOSCOREACEAE

The family includes twining or climbing, seldom erect, herbs arising from tubers most often derived from starchy rhizomes. The leaves are alternate or opposite, often ovate-cordate, but sometimes with 3–7 digitate leaflets. The inflorescences are spikes, racemes or panicles. The flowers are usually unisexual (very rarely bisexual). There are 6 perianth segments. Stamens 3 + 3, but the inner ones sometimes reduced. The ovary is inferior, rarely semi-inferior or superior, 3-locular, with axile placentation. The fruit is a dehiscent capsule or berry with winged seeds.

Distribution and classification

Dioscoreaceae is a mainly tropical family, including about 7 genera, with the greatest diversity in central and south America, Indo-Malaysia, Micronesia and Madagascar. Representatives occur also in Europe and Africa, but the diversity here is lower. Only one genus, *Dioscorea*, is represented in tropical Africa.

DIOSCOREA L.

The genus includes twining or climbing herbs, often prickly below where browsers have access, but sometimes unarmed. The flowers are unisexual and the plants unisexual (dioecious). The male inflorescences are spicate, racemose or rarely cymose, axillary or forming panicles at the ends of leafless branches; male flowers with campanulate to spreading tepals, and with six stamens, either all fertile or 3 reduced to staminodes. The female inflorescences are spicate and axillary; female flowers with tepals similar to the male ones. The capsules are triangular or deeply three-lobed dehiscent with 3 valves, and with 1–2 seeds in each locule. The seeds are winged or rarely wingless.

The genus includes c. 600 species, occurring mainly in

the Old and New World Tropics; many species in tropical Asia, and with *c.* 10 species in Ethiopia and Eritrea.

Use and chemistry

Several species of *Dioscorea* are used as a staple food in the tropics. These tubers are commonly known as 'Yams'. There has been a developed culture in the domestication of several species in tropical Africa, Asia and America. The major species that are used as food worldwide are: *D. alata* L., *D. esculenta* (Lour.) Burkill, and *D. cayenensis*-*D. rotundata* complex. At least 20 others are used as food in times of famine, and also for medicinal purposes.

A number of species are known to accumulate large quantities of steroidal saponins in their tubers and rhizomes. These have been used by the pharmaceutical industry to develop semi-synthetic corticosteroids and other sex hormones such as p-pills.

Conservation

Recent studies made on the *Dioscorea* species in western Ethiopia have revealed that the peoples of southern and western Ethiopia have a strong tradition in cultivating and domesticating various species with a wide genetic base. Only one of the species, *D. gillettii*, is a near-endemic occurring in south and southeastern Ethiopia and northern Kenya, bordering Ethiopia. The remaining species are non-endemic. Some of the species such as *D. cayenensis*-*D. rotundata* complex occur both in the wild and in cultivation, and others such as *D. abyssinica*, *D. dumetorum*, *D. cochleari-apiculata*, *D. quartiniana* and *D. schimperiana*, occur only in the wild. The removal of vegetation cover by human activities (for agricultural expansion and settlement) undoubtedly reduces the genetic bases of these important cultivated and semi-cultivated crops, leading to genetic erosion. Hence the habitat in which these species occur should be protected. Due to the difficulty in identifying the species, two types of keys are constructed using male and female flowers separately.

Key to plants with male flowers

1. Stems twining to the left (sinistrorse i.e. clock-wise); leaves simple or compound 2
 - Stems twining to the right (dextrorse i.e. anti-clockwise); leaves simple 6
2. Leaves compound 3
 - Leaves simple, entire 5
3. Plants unarmed; leaflets (1–) 3–5(–7); inflorescence in catkins; bracts embracing the flower; stamens 3, staminodes 3 1. *D. quartiniana*
 - Plants with stem spines; leaflets 3; inflorescence in much-branched panicles of dense spikelets formed by cymules of 2–6 flowers; bracts embracing the cymules; stamens 6, at least in the first flower of the cymules 4
4. Leaflets usually 3-nerved; ultimate spikelets of inflorescence 5–10(–15) mm long, subsessile or on peduncles up to 5 mm long; perianth glabrous 3. *D. dumetorum*
 - Leaflets usually 3–5-nerved; ultimate spikelets of inflorescence 20–25 mm long, on peduncles up to 15 mm long; perianth pubescent 2. *D. cochleari-apiculata*
5. Plants with stems less than 2 m long; leaves 1.5–7 × 1–6.5 cm; perianth spreading; stamens 3, staminodes 3 4. *D. gillettii*
 - Plants with stems 3–10 m long; leaves 6–22 × 4.5–17 cm; perianth not spreading; stamens 6 5. *D. bulbifera*
6. Plants pubescent with stellate hairs; perianth c. 2.5 mm long 6. *D. schimperiana*
 - Plants glabrous; perianth 1–2 mm long 7
7. Stems 4-winged or 4-angled; flowers on a zigzag axis 7. *D. alata*
 - Stems rounded, not winged or angled, sometimes slightly furrowed; axis of inflorescence straight 8
8. Plants usually cultivated with superficial tubers (numerous cultivars and clones) and also in the wild; spikes 1–2(–3) in the axils of leaves; petioles not widened at the base; stems prickly in the wild 8. *D. cayenensis*
 - Plants mostly wild, without superficial tubers; spikes 2–6(–8) in the axils of leaves; petioles widened at the base: Stems unarmed 9
9. Leaves cordate to ovate, basal lobes ± rounded, length/width ratio less than 1.8; perianth 1–15 mm long, white or gray, base relatively thicker, not scarious; flowers axis stout; roots unarmed 9. *D. abyssinica*

- Leaves ovate-lanceolate, basal lobes sometimes auriculate; length/width ratio more than 1.8; perianth 15–2 mm long, base scarious; flowers axis slender; roots thorny 10. *D. sagittifolia*

Key to plants with female flowers or fruits

1. Leaves compound, leaflets all entire 2
 - Leaves simple, entire or lobed 4
 2. Plants unarmed; leaflets (1–)3–5(–7) 1. *D. quartiniana*
 - Plants armed with stem spines; leaflets 3 3
 3. Leaflets up to 28 cm long, 3–5-nerved; capsules puberulous at maturity, 5–7 × 25 cm 2. *D. cochleari-apiculata*
 - Leaflets up to 16 cm long, usually 3-nerved; capsules glabrous at maturity, 25–45 × 1.4–2.4 cm 3. *D. dumetorum*
 4. Capsules longer than broad, reflexed; seeds winged at the basal end 5. *D. bulbifera*
 - Capsules broader than long; seeds without a wing or winged all round 5
 5. Plants pubescent with stellate hairs 6. *D. schimperiana*
 - Plant glabrous 6
 6. Plants with stems less than 2 m long; seeds without a wing 4. *D. gillettii*
 - Plants with stems 3–15 m long; seeds winged all round 7
 7. Stems 4-winged or 4-angled 7. *D. alata*
 - Stems rounded, without wings or angles, sometimes slightly furrowed 8
 8. Plants usually cultivated, with rather superficial tubers (numerous cultivars and clones) and also in the wild; petioles not widened at the base; stems pricly in the wild 8. *D. cayenensis*
 - Plants usually wild, without superficial tubers; petioles widened at the base; stems unarmed 9
 9. Leaves cordate-ovate, basal lobes rounded; length/width ratio generally less than 1.8 9. *D. abyssinica*
 - Leaves ovate-lanceolate, basal corners sometimes auriculate; length/width ratio more than 1.8 10. *D. sagittifolia*
-



Dioscorea
quartiniana

1. *Dioscorea quartiniana* A. Richard

The specific epithet '*quartiniana*' was given in honour of the French Botanist, Quartin-Dillon who collected the type specimen from Aderbati in Tigray floristic region. The species was described in 1851 by A. Richard.

It differs from the other *Dioscorea* species with compound leaves (*D. cochleari-apiculata* and *D. dumetorum*) by having 3–5 leaflets and unarmed stems. In contrast, *D. cochleari-apiculata* and *D. dumetorum* have 3 leaflets and stems with spines.

Description

Unarmed climber, 2–6 m long. Stems glabrous or sparsely pubescent. Bulbils rarely present, globose in outline, 0.7×0.7 cm, flushed purple. Tubers annual, 8–15 cm long, generally thin and assembled together in groups of 3–6. Leaves alternate with (1–)3–5(–7) leaflets; petiole 0.1–0.5(–1) cm long; leaflets with petiolule 0.1–0.3 (–0.5) cm long, extremely variable in size and shape, usually broadest in the lower two-thirds, $2\text{--}14 \times 1\text{--}8$ cm, acute to acuminate or rounded at the apex, rounded to cuneate at the base, often at least thinly hairy beneath. Male inflorescences: 2–10 pedunculate catkins in the axils of leaves or in pendulous leafless axillary panicles, up to 30 cm long; peduncle 0.3–3 cm long; catkins 0.6–3(–4) cm long; axis not visible between the flowers; bracts usually concave, ovate, acuminate. Male flowers: perianth completely hidden by the bracts; stamens 3; staminodes 3. Female inflorescences: one to several axillary spikes with flowers close together at first, the internodes elongating greatly with age; spikes pendulous, 7–18 cm long. Female flowers: perianth and ovary pubescent. Capsule oblong-elliptic, $2\text{--}3.7 \times 1\text{--}1.7$ cm, glabrescent, reflexed. Seeds winged on basal side only.

Habitat and distribution

The species grows in *Acacia-Commiphora* woodland, deciduous wooded grassland with *Anogeissus*, *Boswellia*, *Acacia* and *Cussonia* species, grassland with thickets and riparian forests between 1200 and 2650 m and is widespread in Ethiopia and Eritrea. It is also common west to Gambia and south to Transvaal and on Madagascar. The main flowering period in Ethiopia is from April to June; sometimes in September. The tubers are edible after detoxification and are used as a famine food.



Dioscorea cochleari-
apiculata

2. *Dioscorea cochleari-apiculata* De Wild

The specific epithet '*cochleari-apiculata*' refers to the spoon-shaped (*cochleari*) apical part of the leaf ending abruptly in a short point (*apiculata*). The species was



Fig. 133.
Dioscorea
cochleari-
apiculata,
from Adi Arkay,
Gonder floristic
region.

described by De Wild in 1914 from a plant collected from Katanga in Congo.

It differs from the related species *D. dumetorum* by having 3–5 nerved leaflets and pubescent perianth and capsules. In contrast, *D. dumetorum* has 3-nerved leaflets and glabrous perianth and capsules.

Description Climber, closely allied to *D. dumetorum*, but more vigorous and with larger leaves and flowers. Stems prickly, growing 12–15 m long, densely pubescent when young, later becoming glabrescent. Bulbils often present in the axils of the leaves. Tubers 4–6, globose, renewed annually. Leaves alternate, 3-foliolate; petiole up to 28 cm long, prickly; leaflets with petiolule 0.6–0.7 cm long; lateral leaflets asymmetrical, median leaflet obovoid to broadly obovoid, 13–20 × 12–13 cm, acutely acuminate at the apex, cuneate to rounded at the base, conspicuously 3–5nerved from just above the base. Male inflorescences: branched panicles of dense, cylindrical and divergent spikelets, 2–2.5 cm long; peduncle up to 1.5 cm long. Male flowers:

perianth subglobose c. 1 mm long, densely pubescent; stamens 6. Female inflorescences: pendulous spikes 15–20 cm long, in the axils of leaves. Capsule $5-7 \times 2.5$ cm, velutinous, reflexed upwards. Seeds with a wing on the basal side only.

Habitat and distribution

The species grows in broad-leaved deciduous woodland with *Adansonia digitata* and *Boswellia papyrifera*, along river valleys between 900 and 1300 m in Tigray and Gonder floristic regions. It also occurs in Tanzania, Burundi, Zaire, Zambia, Malawi, and Zimbabwe. The main flowering period in Ethiopia is from August to September.



Dioscorea dumetorum

3. *Dioscorea dumetorum* (Kunth) Pax

The specific epithet '*dumetorum*' refers to the thicket (*dumetum*) habitat in which the plant grows.

The species was described as *Helmia dumetorum* by Kunth in 1850 from plants collected in Tigray floristic region by Schimper. It differs from the related species, *D. cochleari-apiculata* by the 3-nerved leaflets and the glabrous perianth and mature capsule glabrous. In contrast, *D. cochleari-apiculata* has 3-nerved leaflets, and perianth and mature capsule pubescent.

Description

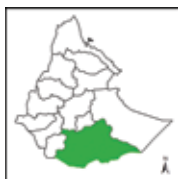
Prickly twiner or climber, stems growing 8–10 m long. Bulbils in the axils of leaves, prickly, 3–5 cm long, pubescent. Tubers renewed annually with several per plant; each tuber subglobose or cylindrical. Leaves alternate, 3-foliolate, pubescent above, tomentose below, rarely glabrescent; petiole 5–20 cm long, generally prickly; petioles, 0.3–1 cm long; lateral leaflets obovate, $5-16 \times 3-15$ cm, acute to acuminate at the apex, cuneate or rounded at the base, conspicuously 3-nerved from just above the base. Male inflorescences: axillary or terminal, much branched panicles of dense spikes; spikes short, 0.5–1 (–1.5) cm long, subsessile or with peduncle up to 0.3 cm long, cylindrical; bracts broadly ovate, adpressed to the perianth and partly concealing it, densely pubescent. Male flowers: perianth subglobose, glabrous, opening little; stamens 6 at least in the first flowers and 5 or fewer in successive ones. Female inflorescences: pendulous axillary spikes, 10–20 cm long. Female flowers: directed downwards, softly tomentose all over; ovary densely pubescent. Capsules directed upwards, $2.5-4.5 \times 1.7-2.4$ cm, glabrous to sparsely pubescent. Seeds with a wing on the basal side only.

Habitat and distribution

The species grows in *Combretum-Terminalia* woodland and secondary thickets, and along river valleys between 900 and 1525 m in Tigray, Gonder, Gojam, and Wellega floristic regions in Ethiopia and in Eritrea. It is also

widespread to Senegal in the west and to Transvaal and Angola in the south. The main flowering period in Ethiopia is from August to September.

This species includes wild varieties with poisonous tubers and bulbils with alkaloids (dioscorine and dihydro-cortisone). The wild tubers are eaten in times of famine, only after repeated washing.



Dioscorea gillettii

4. *Dioscorea gillettii* Milne-Redhead

The specific epithet '*gillettii*' was given in honour of the English botanist, Jan Gillett, who had collected much in eastern and ortheastern Africa. One of his collections from the Kenya-side of Moyale was designated as a type of the species. The species was described in 1963 by Milne-Redhead.

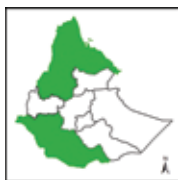
It differs from a similar species, *D. bulbifera*, by the stems growing only up to 2 m long, male flowers with 3 stamens, and with wingless seeds. In contrast, *D. bulbifera* has 3–10 m long stems, male flowers with 6 stamens and winged seeds.

Description

The plant is a small herbaceous twiner, less than 2 m high. Stems unarmed, glabrous. Tuber perennial, spreading horizontally just below the soil surface with fringing roots, 3.5–4.5 x 2.5–3.2 cm. Leaves alternate, rarely sub-opposite; petiole 0.5–5 cm long; blade ovate-cordate, 1.5–9 × 1–7.5 cm, acute to acuminate at the apex, deeply cordate at the base. Male inflorescences: In the axils of leaves, 1–14 cm long; with single pedicillate flowers or short 2–4 flower cymules at each node. Male flowers: perianth spreading, 4–5 mm wide; segments elliptic; stamens 3 and staminodes 3. Female inflorescences: one raceme per leaf axil, usually 2-flowered, rarely one or more. Female flower: perianth spreading, 5–6 mm wide; ovary glabrous. Capsule obovate to suborbicular, 2.2–2.7 × 2–3 cm, winged, with parallel nerves extending from the suture towards the axis, not reflexed. Seeds without a wing.

Habitat and distribution

The species grows in *Acacia-Commiphora-Boswellia* woodland and wooded grassland between 850 and 1650 m in Sidamo and Bale floristic regions. It also occurs in Kenya. The main flowering period in Ethiopia is from April to June and also from October to November.

*Dioscorea bulbifera*

5. *Dioscorea bulbifera* L.

The specific epithet '*bulbifera*' refers to the plant being bulb (*bulbi*-) bearing (*fera*).

The species was described by Linnaeus already in 1753 from a plate from Hermann's *Paradisus Batavus*.

It differs from the similar species *D. gillettii* by having 3–10 m long stems, male flowers with 6 stamens, and winged seeds. In contrast, *D. gillettii* has up to 2 m long stems, male flowers with 3 stamens, and seeds without a wing.

Description

Climber, growing 3–10 m high with twining stems, not prickly. Tuber renewed annually, subglobose, absent in several cultivars. Aerial axillary bulbils variable, 1–10 cm in diameter, weighing up to 2 kg; skin grey, brown, violate or purple; smooth or verrucose; angular or irregularly subglobose or flattened; flesh mucilaginous, white, yellow, purplish or liver coloured; toxic or edible. Leaves always alternate; blade broadly ovate, to cordate, 6–22 × 4.5–17 cm, 6–8 nerves, acuminate at the apex, cordate at the base. Male inflorescences: 3–5 spikes, 3–12 cm long in the axils of leaves or on a leafless panicle, not spreading. Male flowers all point towards



Fig. 134.
Dioscorea
bulbifera, from
Tikil Dingay,
Gonder floristic
region.

the apex of inflorescence; perianth white, turning pink or purple with age; stamens 6, those of the outer whorl longer than the inner ones. Female inflorescences: 1–6 spikes at a node, up to 25 cm long. Female flowers: perianth white, turning pink or brown when old. Capsule oblong ellipsoid, $2-3 \times 1.2-1.6$ cm, reflexed at maturity. Seeds winged at the basal end, $c. 2 \times 0.7$ cm. Some edible varieties have lost their ability to produce flowers.

Habitat and distribution

The species grows on steep slopes in broad-leaved deciduous woodland, riverine forest and at edges of forest, also cultivated in home gardens between 600 and 1500 m in Tigray, Gonder, Gojam, Illubabor, Kefa, Gamo Gofa, and Sidamo floristic regions in Ethiopia and in Eritrea. It is also widespread in tropical Africa and Asia, Pacific Islands, and it has been introduced to tropical America. The main flowering period in Ethiopia is from August to November.



Dioscorea schimperiana

6. *Dioscorea schimperiana* Kunth

The specific epithet '*schimperiana*' was given in honor of the German Plant collector, W.G. Schimper, from one of whose collection the type specimen was designated. The species was described by Kunth in 1850 from a plant collected in Djeladjeranne in Tigray floristic region.

It differs from all the related species with simple leaves by having pubescent leaves and stems.

Description

Climber, with stems 3–6 m long, covered with stellate or branched hairs, generally green, sometimes red-violet. Small bulbils borne in the axils of upper leaves, subglobose, $0.8-4 \times 0.6-2.5$ cm. Tuber annual, irregularly cylindrical, descending vertically, 35–50 cm long, 5 cm thick, $\pm$ branched. Leaves usually opposite, occasionally subopposite or alternate; petiole 4–14 cm long; blade cordate, suborbicular or ovate, $4.5-22 \times 4-17$ cm, acuminate at the apex, cordate at the base with scattered stellate hairs above, denser below; 7–9-nerved, secondary nerves parallel; petiole 5–14 cm long. Male inflorescences: 2–12 pendulous spikes, 3.5–14 cm long, in the axils of leaves, covered with stellate hairs. Male flowers: perianth sessile, 2–2.5 mm in diameter, cup-shaped; outer whorl ovate-lanceolate, obtuse, stellate pubescent outside; inner whorl glabrous; stamens 6. Female inflorescences: 1–2 pendulous spikes in the axils of leaves, 8–18(–25) cm long with 10–22 flowers or fruits along the axis, pubescent to tomentose. Capsule subtriangular to trapezoidal, $1.8-3 \times 1-3$ cm, reflexed at maturity, pilose when young, glabrescent when old. Seeds with annular wings, $1.1-2.3 \times 1-1.4$ cm.

Habitat and distribution

The species grows in gallery forest, at edges of forest, or in *Acacia seyal*-*Entada abyssinica*-*Stereospermum*

kunthianurn woodland, disturbed areas on dark-brown loamy soil or lava, between 1600 and 2000 m, and it is widespread in Ethiopia. It also grows west to Nigeria and south to Zimbabwe and Mozambique. The main flowering period in Ethiopia is from May to June.



Dioscorea alata

7. *Dioscorea alata* L.

The specific epithet '*alata*' refers to the winged stems. The species was described by Linnaeus in 1753 from a plant collected in Sri Lanka (Ceylon) by Hermann.

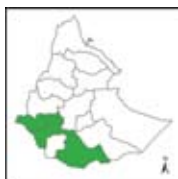
It differs from all the related species with simple leaves by the winged or four-angled stems. In contrast, the other species have stems that are rounded and without wings.

Description

Vigorous twiner with stem 10–12 m long, unarmed, glabrous, 4-angled or 4-winged. Some forms bear bulbils. Tuber annual, often large, varying in size and colour; single or digitate, descending vertically, branched or recurved as a tusk of an elephant, sometimes twisted; flesh generally white, sometimes mottled with purple or wholly purple. Leaves opposite, sometimes the lower alternate or with 2–4 cataphylls at the base, higher up sometimes in whorls of 3 or 4; petiole 8–10 cm long, winged and decurrent on the stem; blade ovate to broadly elliptic to deeply cordate, with overlapping lobes in the basal leaves; 6–22 × 3–18 cm, acute at the apex, subtruncate to cordate at the base; 5–7(–9) nerved. Male inflorescences: axillary panicles of several leafless spikes, 15 cm or more long; each spike with 12–20 sessile alternately arranged flowers on a zigzag axis. Male flowers: perianth subglobose; outer whorl oval-elliptic, inner whorl subspathulate; stamens 6. Female inflorescences: solitary spikes in the axils of leaves, 20–30 cm long, glabrous. Capsule emarginate, 20–25 × 30–35 mm, glabrous. Seeds suborbicular, winged all round.

Habitat and distribution

The species is cultivated for its edible tubers at around 1900 m in Illubabor floristic region. It is also cultivated in most parts of the tropics.



Dioscorea cayenensis

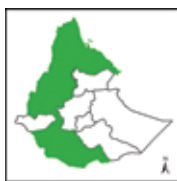
8. *Dioscorea cayenensis* Lamarck

The specific epithet '*cayenensis*' refers to the name of the locality, *Cayenne*, in French Guyana from where the type specimen was collected. The species was described by Lamarck in 1789.

Wendawek Abebe (2008), that carried out molecular research in the species complex in the south and SW Ethiopia considered the two cultivated species (*Dioscorea cayensis* and *D. rotundata* that form a complex) to be the same as the wild *D. praeheensis* and kept them under the oldest name *D. cayensis*, a concept followed here. The complex differs from the related species, *D. abyssinica* and *D. sagittifolia* by usually having spines on the stem and a petiole that is not widening at the base.

Description Annual twiner. Stems prickly or unarmed. Superficial roots prickly or unarmed. Leaves opposite above, alternate at the base, sometimes the basal leaves modified and reduced to cataphylls; petiole 5–12 cm long; blade broadly ovate to suborbicular, 6–12 × 5–10 cm, acuminate at the apex, broadly cordate at the base; 5–7-nerved. Male inflorescences: 1–3 spikes, 4–6 cm long in the axils of leaves. Female inflorescences: 1–2 spikes in the axils of leaves, 10–12 cm long, few-flowered. Capsule 2–2.5 × 3–3.5 cm. Seeds winged all round, 1–1.5 × 1–1.5 cm.

Habitat and distribution The species is cultivated between 1700 and 1800 m in Kefa and Sidamo floristic regions and grows wild in secondary forests between 550 and 1600 m in Sidamo, Kefa, Illubabor floristic regions. It is also cultivated and widespread throughout tropical Africa. The main flowering period in Ethiopia is from April to June and from September to October. The tubers of the wild forms are eaten during famine.



Dioscorea abyssinica

9. *Dioscorea abyssinica* Hochstetter ex Kunth

The specific epithet '*abyssinica*' refers to the former name of Ethiopia, *Abyssinia*. The species name was proposed by Hochstetter, and the species was described by Kunth in 1850 from a plant collected in Djeladjeranne, Tigray floristic region by Schimper.

It differs from the related species *D. sagittifolia* by having leaves where the basal lobes are rounded. In contrast, *D. sagittifolia* has leaves with sagittate to auriculate basal lobes.

Description Climber, stems growing 2–5 m long, unarmed, glabrous. Tubers annual, edible, growing deep in the ground, up to 6 × 2–3 cm, cylindrical, slender, sometimes branched; flesh generally white or light lilac. Roots unarmed. Leaves generally opposite; petiole 3–6 cm long, glabrous; blade cordate-ovate, broadly elliptic to triangular, 4–12 × 2–6 cm, acuminate, cuspidate at the apex, cordate at the



Fig. 135.
Dioscorea
abyssinica, from
Tikil Dingay,
Gonder floristic
region.

base; 5–7nerved; venation on either side of the midrib fairly close. Male inflorescences: 3–6 spikes, 2–7(–10) cm long in the axils of leaves. Male flowers: perianth segments suborbicular. Female inflorescences: 1–2 spikes, 8–15 cm long in the axils of leaves. Capsule glaucous, slightly emarginate at the apex, 2–2.2 x 3–3.5 cm. Seed with wing all round, 1.5–2 × 1.5–2 cm.

**Habitat and
distribution**

The species grows in woodland or wooded grassland with species of *Combretum*, *Terminalia*, *Stereospermum*, *Oxytenanthera*, between 1000 and 1800 m in Tigray, Gonder, Gojam, Wellega, Kefa, Gamo Gofa, and Sidamo floristic regions in Ethiopia, and in Eritrea. It is also widespread west to Senegal. The distribution of the species may not be as wide as is indicated here. However, this requires a need for further field observation and clear morphological separation from *D. cayenensis* complex. The main flowering period in Ethiopia is from July to October.



*Dioscorea
sagittifolia*

10. *Dioscorea sagittifolia* Pax

The specific epithet '*sagittifolia*' refers to the arrow shaped (*sagitti*-) leaf (*-folia*) bases.

The species was described by Pax in 1892 from a plant collected in Djur, Central Africa by *Schweinfurth*.

It differs from the related species *D. abyssinica* by having leaves where the the basal lobes are sagittate to auriculate. In contrast, *D. abyssinica* has leaves with the basal lobes being rounded. Of the two varieties, *D. sagittifolia* var. *lecardii* (De Wild.) Nkounkou occurs in Ethiopia.

Description Climber, stem 4–5 m long, unarmed, glabrous. Tubers annual, descending vertically and found deeply (to 40 cm) below the surface, protected by thorny roots. Leaves opposite, rarely alternate; petiole 1.5–3.5(–5.5) cm, glabrous; blade firm in texture, ovate-lanceolate to deltoid, 3.7–12 × 1.5–6 cm, tapering, acute at the apex, often broadly cordate to hastate at the base; 5–7nerved. Male inflorescences: (1–)2–4 spikes, 1.5–3(–5) cm long, in the axils of leaves. Male flowers: perianth glabrous, subglobose, 1.5–2 mm; outer perianth segments with or without a small scarious base. Female inflorescences: 1–2 spikes, 15–20 cm long, in the axils of leaves. Female flowers: perianth subglobose c. 2 mm in diameter. Capsule with waxy cover, 1.9–2.2 × 2.8–3.2 cm. Seeds winged all round, c. 1.5 × 1.5 cm.

Habitat and distribution The species grows in open montane forest with *Trichilia dregeana* and in wooded grassland, between 1350 and 1700 m in Shewa and Kefa floristic regions. It also occurs in Uganda, Tanzania, Sudan, and west to Senegal. The main flowering period in Ethiopia is from April to July.

TACCACEAE

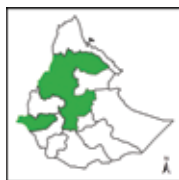
This family includes only one genus, *Tacca*, distributed pantropically, with its centre of variation in SE Asia and Polynesia. It is a unique and systematically isolated family, but with connections to Dioscoreaceae.

TACCA J.R. & G. Forst.

The genus includes tall herbs, up to 2 m, growing from tuberous rhizomes. The leaves have long petioles and are often strongly dissected, a very rare trait for a lily, more commonly found in the family Araceae. The inflorescence is umbellate with rather inconspicuous flowers, subtended by long prominent involucral bracts. The flowers are bisexual, regular with 3 + 3 united tepals and 3 + 3 stamens inserted on the corolla tube. The filaments are short, wide and flattened, extending into a hoodlike structure covering the anther. The ovary is inferior with 3 well developed stigmatic branches, and it develops into a berrylike fruit.

Distribution and reproduction

The genus includes *c.* 10 species which are widely distributed in the tropics. Only one species is found in Africa. The flowers have unpleasant smell that attract carrion and dung flies that act as pollinators. The hoodlike structures on the stamens may create traps for insects. Birds are probably involved in the seed dispersal, efficient enough to disperse the species over large areas. Since the plants are useful to man it is probably also spread by humans. The seeds have a spongy seed coat with a sweetish taste. The tubers are used for food (starch content up to 27%) and as medicine. They also include a bitter substance, taccalin, that has to be removed before the tubers are eaten. They are traded under the misleading name of East Indian Arrowroot.



*Tacca
leontopetaloides*

***Tacca leontopetaloides* (L.) O. Ktze**

The species epithet refers to *leon*, the Greek word for lion, which probably is connected to the striking appearance of the inflorescence with its long, hanging bracts (not petals as indicated by the epithet) might remind of a lion's mane. The appearance of the plant is not really lily-like, and the species cannot be confused with anything else. The umbellate inflorescences with the long, hanging bracts are very characteristic.

Description Plants from tubers up to 10 cm across. Leaves 1–3 with a petiole up to 150 cm and blade up to 120 × 70 cm, but usually smaller, palmately 3-divided, with each of the 3 segments pinnately lobed or dissected. Inflorescence 10–40 flowered on a hollow stem up to 170 cm long, with 5–6 leafy broad involucral bracts and many 5–20 cm long, hanging, filiform bracteoles. Pedicels 2–3 cm long. Flowers greenish yellow or purplish green, drooping, smelling of rotten flesh. Tepals fleshy, 3–8 mm long. Fruits subglobose up to 3 cm in diameter, green to light orange.

Habitat and distribution The species grows in thickets or open woodland from about 500 to 1250 m. It is found in the Tigray/Gonder border areas and in Gojam, Shewa, and Illubabor floristic regions. It is otherwise widespread in tropical Africa, Asia and the Pacific Islands. The main flowering period is from May to June, occasionally also in December.

SMILACACEAE

This family includes three genera of climbers with tendrils, of which one, *Smilax*, is species rich and widely distributed in tropical to temperate regions. This is the only genus represented in Africa.

SMILAX L.

The genus was already described in 1753 by Linnaeus. It includes perennial climbers with tendrils developed from the leaf bases (transformed stipules). The leaves are ovate to cordate with 3–7 curved-convergent main nerves with reticulate venation between the primary veins; usually with a distinct petiole. The inflorescences are produced from the leaf axils and are umbelshaped, racemose or spicate. The flowers are most often unisexual and most often rather inconspicuous, with 3 + 3 tepals. The male flowers have usually 6 stamens, and the female a superior ovary of 3 united carpels, developing into a berry.

Distribution and reproduction

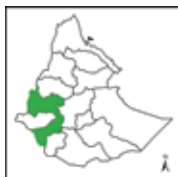
The genus includes *c.* 300 species which are widely distributed in the tropical, subtropical and temperate regions. The flowers are pollinated by small unspecialised insects, wind might also be involved. The seeds are dispersed by fruiteating birds and mammals. *Smilax* species are used medicinally, with leaves, roots and stems used to make infusions. Young shoots may be used as vegetables.

Key to the species

1. Leaf blades rounded or gradually narrowing towards the base, widest at the middle; inflorescence a simple umbel 1. *S. anceps*
- Leaf base truncate or heartshaped at the base, widest below the middle; inflorescence of several few-flowered umbels, appearing racemose 2. *S. aspera*



Fig. 136. *Smilax anceps*, from Tepi on the border between Illubabor and Gonder floristic regions.



Smilax anceps

1. *Smilax anceps* Willdenow

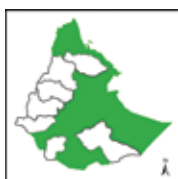
The species epithet means two-edged in Latin and may refer to the winged petiole. It was described by Willdenow in 1806 based on material from Mauritius. The species is recognised by its umbellate inflorescences.

Description Climbing shrubs with slender woody stems up to 6 m long, often with prickly spines in the lower parts. Leaves alternate, petiole 1–2.5 cm long without prickles, angular to winged with two coiling tendrils up to 10 cm long, blade 5–16 × 2–10 cm, leathery, broadly oblong to elliptic, rounded or gradually narrowing at the base, conspicuously 3–5 nerved from base to apex. Inflorescence a simple spherical umbel with 10–20 flowers; pedicels 7–11 mm when flowering, up to 25 mm in fruit. Tepals 4–6 × 0.5–1 mm, greenish to cream yellow; male flowers with stamens 5 mm long; female flowers with ovary 2 mm long, style absent, stigma 3-branched. Berry 5–9 mm in diameter, globose, green when unripe, maturing to purple-black. Seeds, few, 3–4 mm in diameter.

Habitat and distribution The species grows in gallery forests near streams and rivers between 1150 and 1700 m. It is recorded from Wellega and Kefa floristic regions, and is otherwise widely distributed from West Africa to South Africa and also in Madagascar, Mauritius and Reunion.



Fig. 137. *Smilax aspera*, Chilimo forest, Shewa floristic region.



Smilax aspera

2. *Smilax aspera* L.

The species epithet refers to *asper* which means rough or rugged and refers to the prickly habit of the whole plant. It was described by Linnaeus in 1753 from material grown in a European botanic garden. The species is recognised by a racemose inflorescence that consists of several few-flowered umbels along a rachis. It is in general more prickly than the former species.

Description

Climbing shrubs with slender woody stems up to 5 m long, often with prickly spines in the lower parts. Leaves alternate, petiole 2–4 cm long, often with prickles, flattened with two coiling tendrils, blade 3–12 × 1–9 cm, leathery, triangular to elliptic with cordate to truncate base, 5–7 nerved from base to apex, sometimes with prickles on margin and major nerves. Inflorescence of small umbels along branched or unbranched axes, 2.5–7.5 cm long, each umbel with 3–10 flowers; pedicels 2–5 mm. Tepals 2.5–4 × 0.8–1.3 mm, white or cream; male flowers with stamens 3 mm long; female flowers with staminodes and ovary 2–2.5 mm long, style absent, stigma 3-branched. Berry 4–8 mm in diameter, globose, green when unripe, maturing to red or purple. Seeds few, 3 mm in diameter.

Habitat and distribution

The species grows in forests or forest edges, scrambling over shrubs and trees, sometimes along roadsides between 1900 and 3200 m. It is recorded from Welo, Shewa, Arsi, Kefa, Sidamo, and Harerge floristic regions in Ethiopia

and also in Eritrea. It is widespread in the Mediterranean area and reaches south to Tanzania and Zaire. It is further found in the Himalayas and on Sri Lanka. It appears to be flowering all year round.

VELLOZIACEAE

This family includes about 8 genera, with a center of diversity in South America. Only two, *Xerophyta* and *Talbotia*, occur in Africa, the latter restricted to South Africa. The family includes mainly shrubby perennials, with branched stems covered by persistent leaf bases and roots that form a mantle around the stems. The family is probably old, and the Amphiatlantic distribution might go back to the Gondwana continent in the southern hemisphere. It was earlier believed to be related to the family Hypoxidaceae, but modern analyses have not supported this view. It is systematically isolated, and may not be related to lilies at all. Molecular data indicate a relationship to e.g. the screw palms (*Pandanus*), but morphologically they have little in common.

XEROPHYTA Jussieu

The genus was described by Jussieu in 1789 and refers to the adaptation to dry habitats (*xero* = dry, *phyton* = plant in Greek). The function of the fibrous mantle around the stems is to gather moisture from fogs and rains and at the same time protect the stem from fires. Species of the genus have been shown to survive down to 0% relative humidity, and they revive after being more or less completely dehydrated. In older floras the African representatives were referred to *Vellozia*, a genus now defined to include only South American members.

The plants are often more or less branched shrubs with narrow, leathery, grass-like leaves tufted at the end of the fibrous branches. The flowers are showy, pinkish to whitish, solitary from leaf axils. They are bisexual with an inferior ovary. The six petal-like tepals are free or united into a basal tube. The filaments are flattened and almost completely fused with the tepals so that the anthers appear to be sessile. The fruits are hairy or sticky capsules that opens by longitudinal slits or pores.

Distribution and reproduction The genus includes about 30 species, distributed in Madagascar, the African continent and southwest Arabia. Four species are recorded from Ethiopia.

Little is known of pollination, but the flower syndrome indicates that large insects are involved. Relatives from South America with similar flowers are known to be pollinated by bees, hawkmoths, birds and bats. The seed dispersal is ballistic, meaning that the seeds are kept inside the capsule until strong wind or animals throw the seeds out of slits or pores.

Key to the species

1. Plants 20–200 cm tall with well developed branches; leaves with both simple and complex stiff flattened hairs in clusters on the lower surface 4. *X. spekei*
- Plants usually less than 20 cm tall, unbranched or slightly branched; leaves glabrous or with fine hairs 2
2. Ovary and fruit covered by globular gland-cells; leaves mostly in basal rosette, sheaths not distinct, broken up into fibres 3. *X. humilis*
- Ovary and fruit densely covered by stiff non-glandular hairs; leaves mostly on stems, sheaths remaining distinct, only splitting up into fibres when old 3
3. Leaves mostly glabrous, sometimes a few hairs on the margins and lower surface; only simple hairs present 1. *X. schnizleinia*
- Leaves mostly pubescent; both simple and complex hairs present 2. *X. rippsteinii*



*Xerophyta
schnizleinia*

1. *Xerophyta schnizleinia* (Hochstetter) Baker

The species is named to honour the German botanist and pharmacist Adalbert Schnizlein. It was described by Hochstetter in 1844 in the genus *Hypoxis*, based on material that Schimper collected in the Semien mountains. Baker transferred it to *Xerophyta* in 1875.

This is a very variable species, the most widespread of the Ethiopian taxa, and it is recognized by the almost glabrous leaves and the densely haired capsules. It is a complex species which should be studied further.

Description Plants of very variable size, forming tussocks. Stems short or long, 0.5–1.5 cm wide, simple or slightly branched. Leaves, linear, 5–40 × 0.2–0.7 cm, scabrid on margin and midrib, otherwise glabrous or with a few simple hairs. Flowers 1–3 at the apex of the stem; flower stalks 3–30 cm long. Top of the peduncle and ovary densely covered with thick stiff simple hairs. Tepals white with or without a pink tinge, linear-lanceolate 10–40 mm long; anthers yellow, 7–15 mm long. Capsule globose, 7–15 mm in diameter, densely covered with stiff, dark brown hairs.

Subspecific key

1. Fairly robust plants; stem 1–1.5 cm thick at the base; leaf blade 10–40 × 0.4–0.7 cm, usually straight; flower stalks 10–30 cm long; tepals (15–)20–40 mm long; anthers 10–15 mm long; capsule 12–15 mm long with hairs c. 1.5 mm long **a. var. schnizleinia**
- Small plants; stem 0.5–0.8 cm thick at the base; leaf blade 5–15 × 0.2–0.4 cm, usually curved; flower stalks 3–10 cm long; tepals less than 10 mm long; anthers 7–10 mm long; capsule 7–12 mm long with hairs c. 1 mm long **b. var. somaliense**

a. var. schnizleinia

Habitat and distribution

This variety is found in rock crevices, particularly in lava flows, but also on limestone, or on stony soils in grassland or open *Acacia-Commiphora* woodland from 30 to 1500 m. It is widespread in Eritrea and Ethiopia, found in most floristic regions and also occurs in East



Fig. 138.
Xerophyta
schnizleinia var.
schnizleinia,
from Metahara,
Shewa floristic
region.

Africa. The main flowering period in Ethiopia and Eritrea is from April to November.

Habitat and distribution

b. var. *somaliense* (Terracc.) Lye

This subspecies was as the name tells described from Somalia. It grows in shallow soil pockets on rocks or dry sandy open habitats in low rainfall areas between 300 and 700 m. Within Ethiopia it is only known from Harerge floristic region. The flowering period is from November to December, thus not overlapping with the other variety.



Xerophyta rippsteinii

2. *Xerophyta rippsteinii* Smith, Lebrun & Stork

The species is named after the collector of the type material, Rippstein. It appears to be a more densely pubescent relative of *X. schnitzleinia*, and was described as late as in 1986.

Description

Plants forming tussocks of unbranched stems. Leaves linear, strongly recurved, up to 10×0.7 cm, lower surface densely covered with simple or compound hairs. Flowers solitary on stalks, 2–5 cm long. Top of the peduncle and ovary densely covered with thick stiff simple hairs. Tepals 15–25 mm long; anthers yellow, c. 12 mm long. Capsule as wide or wider than long, 10 mm wide, densely covered with stiff hairs.

Habitat and distribution

The species grows on sandy soil in rocky outcrops between 400 and 500 m. It is a local endemic in Bale floristic region and adjacent parts of Somalia.



Xerophyta humilis

3. *Xerophyta humilis* (Baker) Th. Dur. & Schinz

The species epithet means low-growing (close to the soil, *humus*), and it is one of the smallest representatives of the genus. It is further recognized by the glandular ovaries and capsules. Baker described it first in 1889 in the genus *Vellozia*, based on material from South Africa.

Description

Small plants forming dense tussocks or mats. Leaves forming rosettes on the ground, $2-6 \times 0.1-0.2$ cm, stiff, often dark purple, glabrous but scabrid on margin. Flowers solitary on stalks up to 5.5 cm long, with scattered glandular hairs. Tepals 7–10(–15) mm long; anthers 3 mm long. Capsule subglobose, $4-6 \times 5-8$ mm in diameter, covered with globular glands.

Habitat and distribution

The species is found in shallow soil and crevices on granite inselberg and also in *Commiphora* bushland on red soil between 1300 and 1400 meter. It is only known from Sidamo floristic region in Ethiopia and has otherwise a very disjunct distribution, reoccurring from Zambia and southwards. These relations should be further studied.



Xerophyta spekei

4. *Xerophyta spekei* Baker

The species is named after the soldier and explorer John H. Speke who collected extensively in East Africa around the middle of the 19th century. It was described by Baker in 1895 from Tanzanian material. It is the only tall species, up to about 2 m, of the genus found in Ethiopia. The trunk, formed mostly from the specialized roots, is up to 10 cm wide at the base.

Description

Branched shrubs up to about 2 m. Leaves linear, $7-30(-70) \times 0.2-1.2$ cm, densely covered with white hairs below, simple or in clusters. Flowers 1–3 at the apex of the stem; flower stalks 2–8 cm long with glandular hairs. Tepals white to lilac or mauve, linear-lanceolate 20–35(–50) mm long; anthers 13–20 mm long. Capsule subglobose, up to 15 mm long with spaced glandular hairs.

Habitat and distribution

The species belongs to rocky outcrops in dry areas, and has only been collected in the southernmost Ethiopia (Sidamo (or possibly Bale) floristic regions) close to the Kenyan border. It is further known from Kenya, Tanzania and Zambia. in the main flowering period in Ethiopia is in June.

List of botanical terms

- acaulescent** without an easily seen stem
- actinomorphic** (about flowers) radially symmetrical, can be divided into two identical halves by several radial lines.
- acuminate** becoming gradually narrower to a slender point.
- anthesis** the period when the pollen is shed and the stigmata are receptive to pollen; from the opening of the flower bud to the setting of the seed.
- aril** an outer covering or appendage, often fleshy and/or brightly colored, that encloses the seed.
- attenuate** tapering gradually to a slender point.
- basifixed** (about anthers) the filament is attached to the base of the anther.
- bilaterally symmetry** when a structure has one plane of symmetry; if cut along this plane the two halves are mirror images of each other; usually used for flowers (synonymous with zygomorphic).
- bifacial** (about leaves) with clearly defined upper and lower surfaces throughout the leaf.
- bract** small leaf-like structure usually associated with a flower and/or inflorescence.
- campanulate** bell-shaped, with a broad tube and a wide opening.
- canaliculate** having a distinct groove running lengthwise.
- capitate** like the head of a pin (as in the thickened stigma of some flowers) or a compact cluster of flowers forming a head.
- cartilagenous** hardened and tough (horn-like), but capable of being bent.
- cataphyll** reduced, scale-like leaf; usually used for reduced leaves other than bracts.
- caudate** abruptly ending in a long and very narrow tip, like a tail.
- caulescent** with a clearly visible stem above ground.
- cauline** placed on an aerial stem.
- cladodes** a leaf-like structure formed by a modified stem.
- clavate** club-shaped; thickened at the end.
- connivent** coming close together or converging, but not united, often closer together above than below.
- coriaceous** with a thick and firm texture, similar to leather.
- corm** a short, thick underground stem, which grows vertically, for example, in many Iridaceae.
- corymb** a panicle-like inflorescence in which the branches or flower-stalks start from different places on the stem, but all the flowers are borne at about the same level.
- corymbose** corymb-like.
- cucullate** hooded or hood-shaped (a hood is a covering for a person's head).

- cyme** an inflorescence in which the main axis is terminated by a flower which opens first, this flower is subtended by two opposite branches each of which ends in a flower, these open next and are likewise subtended by two opposite branches; this branching pattern may continue.
- cymule** a diminutive cyme.
- declinate** bent or curved downward or forward; also used for stamens with sympetalous flowers which are inserted on the ventral (abaxial) side of the corolla tube and then usually bent up.
- decumbent** lying on the ground but with the apex growing upwards.
- decussate** when each pair of opposite leaves are arranged perpendicular to leaf pairs above and below.
- distichous** arranged in two opposing rows.
- divaricate** spreading in different directions.
- dorsifixed** (about anthers) attached to the back or dorsal side.
- elaiosome** an outgrowth from a seed containing oil or fat and which is often attractive to ants which aid in the dispersal of the seed.
- endemic** being confined to a particular geographic region.
- ensiform** sword-like.
- epigynous** situated above the ovary.
- equitant** (of leaves) 2 ranked with the leaves arranged so that their bases overlap (fit into) each other.
- falcate** curved like a scythe or sickle.
- extrorse** facing the outside; of anthers that open away from the center of the flower; the opposite of introrse.
- fascicle** a close cluster of structures arising from about the same point, but lacking a distinct arrangement of parts.
- fasciculate** borne in fascicles.
- fistulose** hollow, like a pipe, and herbaceous.
- funicle** the stalk of the ovule, attaching it to the placenta.
- fusiform** spindle shaped, widest in the middle and narrowing at both ends.
- geophyte** a plant which perennates by subterranean buds.
- glabrous** without hairs, a surface devoid of hairs.
- hyaline** very thin and almost transparent.
- hypogynous** situated below the base of the ovary.
- hysteranthous** not developing leaves before the end of the flowering.
- indigenous** native to a region, not introduced.
- indumentum** any cover of a surface but usually restricted to a covering of hair-like structures.
- inferior ovary** an ovary that is below the attachment of the sepals, petals and stamens, and if present, the calyx tube or hypanthium.
- integument** the structure(s) enclosing the central nutritive tissue of the ovule, finally forming the testa.
- introrse** turned inward toward the central axis of an organ; of anthers that open towards the center of the flower; the opposite of extrorse.
- involucre** a number of bracts that surround the base of an umbel or the base of a flower head.
- locule** a chamber or compartment, mostly of an ovary or a fruit.
- loculicidal** splitting along the central parts of the locule (not in the walls separating the locules).
- moniliform** like a string of beads.
- monophyletic** a taxonomic group where all its members have evolved from a single ancestor, and where all the descendants of that ancestor are included in the group.

- muricate** with a rough surface covered with short hard projections or tubercles.
- ovary** the part of the pistil which contains the ovules.
- ovate** a flat structure which is egg-shaped in outline with the broadest part near the base.
- panicle** a complex, branched inflorescence.
- papilla** (pl. **papillae**) a minute outgrowth.
- papillate** covered with papillae.
- paraphyletic** a taxon that contains some, but not all, descendants of the most recent common ancestor of the group.
- pedicel** the stalk of a single flower.
- peduncle** the stalk that bears an inflorescence consisting of two or more flowers.
- pedunculate** with peduncles.
- perianth** the floral leaves, if undifferentiated called tepals, if differentiated the outer are called sepals, the inner petals.
- petiole** the stalk of a leaf on which the blade is borne.
- phylloclade** a flattened photosynthesising stem.
- placentation** the arrangement of the ovules in the ovary.
- plicate** folded lengthwise, like a fan.
- plesiomorphic** having an ancestral character state.
- polyphyletic** evolved from more than one ancestral group.
- protandrous** when the anthers discharge pollen before the stigma (in the same flower) is receptive.
- puberulous** covered with very short fine hairs, or slightly hairy.
- pubescent** with a covering of soft hairs.
- raceme** an indeterminate inflorescence in which the flowers are borne along a single axis with the uppermost the youngest, each flower with a stalk of about the same length.
- racemose** arranged like a raceme.
- rachis** the axis of a compound leaf; the axis of an inflorescence.
- radially symmetry** see actinomorphic.
- rhpidium** (pl. **rhpidia**) inflorescence consisting of umbellate clusters.
- rhizome** a root-like stem on or beneath the ground with roots growing downwards, and leaves and shoots upwards.
- rosulate** when the leaves are in a rosette.
- rugose** with wrinkles or grooves on the surface.
- rugulose** delicately wrinkled.
- saccate** bag-shaped or sack-shaped, pouched.
- scabrid** (**scabrous**) rough to touch, usually caused by the presence of very short stiff hairs.
- scandent** a general term for climbing.
- scape** a flower stalk (peduncle) without leaves that arises from the ground.
- scarious** thin and dry, not green.
- secund** one sided; as for example flowers which are attached along one side of the axis.
- septicidal** opening at or along the separating walls (or septum).
- serrate** (**serrulate**) with teeth like a saw, the teeth more or less regular and pointing forwards.
- sessile** without a stalk.
- sheath** a tubular structure that encloses an organ or the basal part of it.
- spathaceous** like a spathe.
- spathe** a large bract enclosing or supporting an inflorescence.

- stigma** (pl. **stigmata**) the portion of the pistil (usually at the top of the style) which is receptive to pollen, usually with a sticky or minutely papillate surface on which the pollen germinates.
- subclavate** almost or somewhat clavate.
- subsecund** almost or somewhat secund.
- subulate** narrow, tapering from the base to a tip.
- sulcus** a longitudinal furrow.
- sulcate** with a longitudinal furrow.
- superior ovary** an ovary that is borne above the attachment of the sepals, petals or tepals.
- tendril** a slender, usually coiling, part of a leaf or a stem that helps support the stem.
- tepal** used for the parts of the perianth where the sepals and petals are not differentiated.
- terete** round or circular in cross section.
- triquetrous** with three sharp angles.
- truncate** (of leaves) having a blunt base.
- tuber** a thickened portion of a stem, usually underground.
- tunic** a thin coat or cover.
- tunicate** (of corms) having coats or envelopes, or a thin separable cover.
- turbinate** cone-shaped, but with the broad portion up and the pointed portion down.
- twining** climbing by winding the stem around the support.
- unifacial** (of leaves) the leaf is folded so that it is only the lower surface seen on both sides.
- verrucose** having a surface with raised projections or warts.
- versatile** (of anthers) turning freely on its stalk (filament).
- zygomorphic** flowers having bilateral symmetry so that the flower can be divided equally only along one plane.

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Index to plant names

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